Exploring Transformation of Commercial Centres with respect to process of Urban Development in a City : Case Application of Kolkata

Thesis submitted by

SANGHAMITRA SARKAR

DOCTOR OF PHILOSOPHY (Engineering)

Department of Architecture,

Faculty of Engineering and Technology,

Jadavpur University,

Kolkata - 700032, India

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2. NAME, DESIGNATION & INSTITUTION OF THE SUPERVISOR:

Dr. Sanjib Nag,

Professor,

Department of Architecture, Jadavpur University,

Kolkata -700032, India

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PROFORMA – 1

STATEMENT OF ORIGINALITY

I, **Sanghamitra Sarkar**, registered on **April 25, 2018** do hereby declare that this thesis entitled "EXPLORING TRANSFORMATION OF COMMERCIAL CENTRES WITH RESPECT TO PROCESS OF URBAN DEVELOPMENT IN A CITY: CASE APPLICATION OF KOLKATA" contains literature survey and original research work done by the undersigned candidate as part of Doctoral studies. All information in this thesis have been obtained and presented in accordance with existing academic rules and ethical conduct. I declare that, as required by these rules and conduct, I have fully cited and referred all materials and results that are not original to this work. I also declare that I have checked this thesis as per the "Policy on Anti Plagiarism, Jadavpur University, 2019", and the level of similarity as checked by iThenticate software is **5%.**

Signature of Candidate: Sanghamitra Sarkar

Date : 07.06.2023

Certified by Supervisor:

(Signature with date, seal)

1. S. Nag, 07.06.2023.

Professor
Department of Architecture
Jadavpur University
Kolkata-700032

PROFORMA – 2

CERTIFICATE FROM THE SUPERVISOR

This is to certify that the thesis entitled

"EXPLORING TRANSFORMATION OF COMMERCIAL CENTRES WITH RESPECT TO PROCESS OF URBAN DEVELOPMENT IN A CITY: CASE APPLICATION OF KOLKATA"

submitted by Smt. **Sanghamitra Sarkar** who got her name registered on **April 25,2018** for the award of Ph. D. (Engg.) degree of Jadavpur University is absolutely based upon her own work under the supervision of **Dr. Sanjib Nag** and that neither her thesis nor any part of the thesis has been submitted for any degree/diploma or any other academic award anywhere **before.**

1. S. Nag, 07.06.2023.

Professor
Department of Architecture
Jadavpur University
Kolkata-700032

Dr. Sanjib Nag,
Professor,
Department of Architecture,
Jadavpur University,
Kolkata – 700032, India

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ABSTRACT:

Commercial Centres are economic, social, cultural and administrative hubs for any city. Over the years, they have changed in organisational, spatial, economic and social composition due to alterations in process of Urban Development. Urban Development process determines the course of future development of an urban area or a city. Transformation of Commercial Centres with respect to process of Urban Development have developed as an important area of inquiry in the recent years throughout the world as it has become a common phenomenon across all cities especially in the Global South. These transformations have impacted not only the economic development but also has resulted in massive physical changes in urban form and character of cities. This has led to tremendous social changes which has seen modulations in the preferred kind of shopping based on experiential factors, availability and quality of goods and services and accessibility of multiple functions.

Kolkata, the main Commercial hub of Eastern India has also undergone similar changes over the past 2 decades. The city expansions and related developments have increased the number and types of Commercial Centres present in the city. The urban fabric has seen shopping malls and block markets develop alongside the traditional markets, municipal markets and bazaars. The needs, aspirations and changes in lifestyle has made the shopping mall and related Commercial establishments popular. Commercial Centres have also become recreational and entertainment hubs over the recent years.

This research delves into the understanding the transformation of Commercial Centres with respect to the process of Urban Development through available Literature. The significant research trends have been discussed and the relevant research gaps have been identified to generate research questions, based on above mentioned literature study.

The parameters of Vitality, Liveability and Sense of Place have been identified as the 3 major influential parameters which modulate the transformation of Commercial Centres with respect to process of Urban Development in a City. A list of related sub-parameters and variables have been identified and their inter-relationship has been established, through literature study and Expert Opinion Survey.

This has been used to survey pertinent Commercial Centres which has been selected in the city of Kolkata, where detailed on-site study has been conducted based on above mentioned established parameters and sub-parameters and derived results have been synthesized.

Analytical discussion based on these results have been carried out and a mathematical interpretation of the same has been done related to each of the parameters of Vitality, Liveability and Sense of Place. It has been derived that Pedestrian Flow, Time to Access and Height of building are the 3 main variables which are the regulating factors to ensure minimum attainment of Vitality, Liveability and Sense of Place respectively. The mathematical expressions related to these 3 variables can be used in redevelopment and upgradation of existing Commercial Centres or predict the direction of transformation of new Commercial Centres in the city.

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1.0 INTRODUCTION

1.1 Background

1.1.1 Commercial centres

Commercial Centres (CC) are economic, social, cultural and administrative hubs for any city. Over the years, they have changed in organizational, spatial, economic and social composition due to alterations in process of Urban Development. It is a composed of retail store and related facilities working together to generate profit and performance of various financial and office functions. The oldest CC were marketplaces. Arthur B. Gallion mentions marketplaces to be the centre of cities for exchange of goods and services. Cities developed along riverbanks and coastlines based on booming trade centres. Interaction between new settlements and civilizations though trade gave rise to economic development. CC have evolved from markets in ancient Mesopotamia to the *Agoras* of Greece to the *Souqs* of Middle East and eventually to Canary Wharf, London. They have transformed in shape, form, scale and function developing into a multi-functional public space. CC have been used as an image making entity to reinstate the distinctiveness of cities. Evidently, Times Square in New York ; Merlion in Singapore etc. have become major landmarks showcasing the identity of these cities. CC are thus the physical manifestations of advancement in economic and urban development. Transformation of CC have shaped the commercial and physical structure of cities.

1.1.2 Transformation of Commercial Centres

Transformation of Commercial Centres has occurred over time and has affected not only its composition but also the economic, spatial, social, cultural aspects of the city. The changes in the processes of Urban Development have influenced such transformations. Currently, urban transformation is one of the most influential physical processes for urban growth in cities.

Commercial centres were one of the most important components of cities along with major components alongside the administrative centre and religious centre since ancient times. The focus on each of these centres changes in different cities. Chronologically, city structures have evolved from ancient, medieval, colonial, post-colonial cities and contemporary cities.

Cities in the Asian context are predominantly ancient, medieval, colonial and post-colonial . Ancient cities had the public core which housed all trading activities. Medieval cities were characterised by shopping streets with bustling business comprising of different kinds of traders. 'Shops lined on both sides of the street made it thoroughly active in nature' (Sarkar, 2020). These streets were inherently organised in organic pattern. Colonial marketplaces were more introverted giving rise to marketplaces housed within a building. Shopping arcades were one of the defining features of colonial market places (Sarkar, 2020). Zonal planning concepts in post-colonial cities gave rise to segregated commercial zones with community and neighbourhood marketplaces at the local level.

In recent times, CC have been used for the purpose of image-building in major cities around the world. Change in the typology of commercial activity has transformed the pattern of commercial buildings and resultant urban spaces. Cities in the Global South, especially in Asia hve transformed drastically over the past few decades making dynamic changed in the urban pattern giving them a global image. These cities, like their Western counterparts, have implemented the global processes of urban development which have led them to changing, altering and introducing new typologies of CC in their urban fabric. Cities like Shanghai, Hong Kong, Guangzhou, Delhi, Mumbai, Bangalore, Kolkata etc have emerged as significant commercial hubs of the world. At the city level, multiple CC have been used as generators of development and this decentralisation has helped cities expand to provide goods, services and opportunities for the thriving population. It can be seen that transformation of CC and its effect on Urban Development aur mutually dependent on each other in the process of shaping of cities all over the world.

Fig 1-1: Times Square, New York

(Source: Google Images)

Fig 1-2: Merlion, Singapore CC

(Source: Google Images)

1.1.3 Urban Development

'Urban development (UD) is the process of growth of an area situated in city' (Sarkar, 2020). Throughout history, UD has been associated with physical, social and economic development which resulted in the diverse patterns, practices and policies seen different human settlements, societal establishments and cultural institutions. Urban Transformation processes vary broadly between renewal or rehabilitation of urban areas or manifest itself as new development resulting in growth and extension of cities. These dynamics have shaped rapid growth in various cities of the world especially in Asia.

Development is the buzzword in the fast growing economies of today, especial in countries of the Global South. After the events of World War II, the world had witnessed destruction in all spheres of life. The need to generate stability both in political and economic aspects became a necessity all around the world. World Bank and United Nations formed to take forward the initiative of stability classified nations based on their economic advancements and GDP. This generated the notions of developed and developing nations and the idea of defining a scale to understand the degree of development became popular. Many of the countries devised their urban policies based on the guidelines generated through this classification. Even today, this remains impactful in how the world perceives the notion of development and the urban development directions needed for a stable future growth.

Globalisation was a concept that had taken over the world in the past few decades and has shaped the directions of development in almost all cities in the world today. Markets across the world opened up and the trading policies adjusted themselves to benefit from this exchange aiming for rapid and diverse development across all sectors to create the erstwhile 'Global Cities'. This new venture was known as Neo-liberalism and resulted in 'open, competitive and often unregulated market policy' characterised by creating 'public reform through increased privatisation of social functions' for favourable socio-economic development. This has resulted in tactical urban transformation of CC by a 'variety of institutional restructuring to enhance their local economic growth capacities' (Brenner, 2004). The process of UD thus affected the economic sector rapidly making way for policies which were sometimes overlooking the ground reality al the local level. CC and their trajectory of development reflect this change vividly.

1.1.4 Process of Urban Development

The process of Urban Development determines direction of future development of a city (Sarkar, 2020). This process can have either a planned or an unplanned approach. Urban planning, the planned process of UD, delved into various concepts of development. One of the biggest drivers of development was economic development which was seen in the drastic development of CC in various cities. There has been a lot of experiments towards the typology of CC which generates the most successful business models. Large scale shopping malls and big box stores were popularised in the West for spreading commercial growth. This direction of development spread throughout the world as a result of globalisation and was seen commonly practised in cities all over the world. In the Asian Context, 'China and India are the fastest growing world economies'(Sarkar 2020). The latest projections on the growth of global urban population has indicated that majority of the world population resided in China, India and Nigeria and this growth will be persistent between 2014-2050. The global trends of UD gave rise to megacities which housed large population and provided scope for economic development and opportunities. This promoted in-migration towards the main cities. The megacities (exceeding 10 million inhabitants) or large cities (with 5 to 10 million inhabitants) became common generating developmental pressure on infrastructure resulting in expansion. In recent times, secondary cities have prospered which fast growing as the new centres of UD and supporting the economic endeavours of the main cities. This has resulted in changing the developmental patterns, social and cultural norms, spatial and organisational configurations of these cities. Traditional markets and shopping malls both are co-existing with such policies giving rise too conflicting urban spaces in the city.

Fig 1-3: Traditional Shanghai Markets

(Source: Google Images).

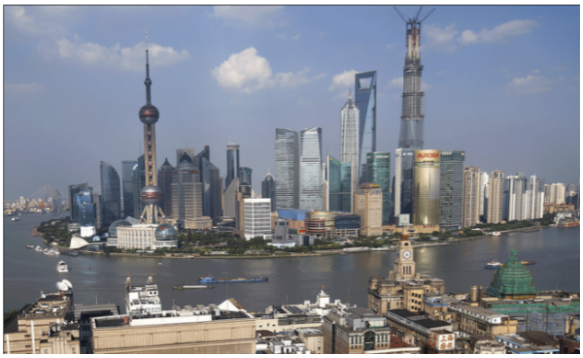


Fig 1-4: Shanghai Financial District

(Source: Google Images)

In recent times, it is evident that commercial centres are undergoing drastic transformations which directly impact on UD process in a city. It has also been observed that this phenomenon is largely uncontrolled, sporadic and piecemeal in nature creating unorganised spatial/ physical environment. In order to restrict further deterioration of this environment, immediate intervention is necessary to rectify the lacuna and arrest further such developments.

1.2 Objectives :

The 4 main objectives are as follows:

1. To study and establish parametric relationship between transformation of CC and process of UD, based on literature study.
2. To study similar transformation of selected CC and corresponding process of UD in the city of Kolkata, applying this relationship.
3. To access the results and evaluate them further by applying the findings on selected sample CC.
4. To formulate guidelines for future such transformation of CC with respect to process of UD, based on this study.

1.3 Research Methodology:

The 7 basic stages of methodology are as follows:

1. The first stage introduces the subject matter of the research work, primarily establishing its background, as well as its objectives and methodology.
2. The second stage defines the important aspects of the research work namely transformation of CC and process of UD and identifies related parameters and sub-parameters, based on secondary exploration.
3. The third stage identifies inter-related parameters and sub-parameters and establishes a parametric relationship between them.
4. The fourth stage defines city of Kolkata, its CC and its urban development and surveys selected CC, applying this relationship.

5. The fifth stage analyses the observations of the survey and evaluates them by applying the findings on selected CC.

6. The sixth stage formulates guidelines to guide such transformation of CC and related process of UD in desired direction, in future.

7. The seventh and concluding stage of the research work identifies contributions, emerging issues and areas for further research.

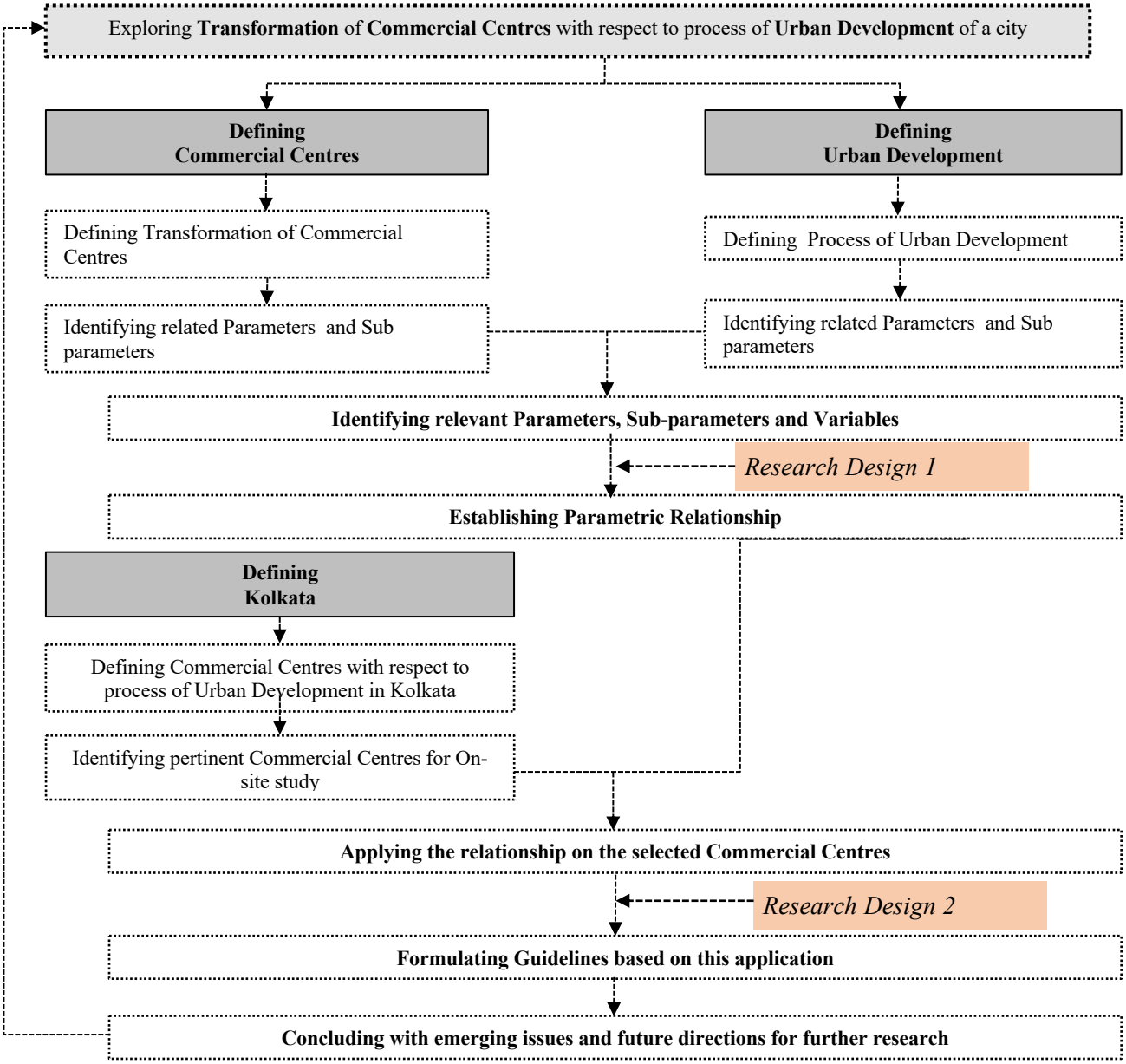


Figure 1-5: Overall Research Methodology

1.4 Scope & Limitation

The scope of the research is :

1. To understand the trajectory of commercial development in cities especially in Kolkata.
2. To understand the factors influencing transformation of CC which is compatible with context of cities like Kolkata
3. To derive methods to rehabilitate/ redevelop/ reimagine existing CC in the city with the help of the above understanding.
4. To predict the effectiveness of new CC in the city of Kolkata and develop typologies compatible to the context.

The limitations of this research are as follows:

1. Only urban design viewpoints of the research and physical/spatial transformation is to be considered.
2. Only existing areas in the city are to be considered both as case example and case application.
3. Only secondary investigations to be considered for establishing the parametric relationship and primary investigations to be considered for formulating strategies and recommendations.

Transformation of CC and process of UD has emerged as an important area of inquiry in the recent years throughout the world as it has become a common phenomenon across all cities especially in Kolkata. These transformations have impacted not only the economic development but also has resulted in massive physical changes in urban form and character of cities. This has led to tremendous social changes which has seen modulations in the preferred kind of shopping based on experiential factors, availability and quality of goods and services and accessibility of multiple functions. The outcome of this entire exercise is expected to contribute towards in exploring the factors influencing such transformation of CC in a holistic manner.

In future, it would help to undertake necessary corrective interventions, in case of similar urban issues , to guide development of CC in desired directions. It would also help to develop forward thinking strategies with alternative intervention schemes in related upcoming situations. Subsequently, the ultimate outcome would be a guideline for overall spatial/ physical transformation direction for such CC in cities like Kolkata and overall quality of life in general.

1.5 Structure of the Thesis

This report has been divided into six chapters described briefly as follows:

Chapter 1: Introduction

This Chapter describes the research background highlighting the research objectives, research methodology, scope and limitation of the research work and structure of the thesis.

Chapter 2: Literature Study

This chapter explores literature related to two aspects namely transformation of CC and process of UD to identify the relevant latest research trends, research gaps and research questions. Thorough investigation of literature showed that the transformation of CC and process of UD are both influenced by three major parameters viz. Vitality, Liveability and Sense of Place. These three parameters are further explored in the following chapter to determine a framework for understanding the path of transformation of CC with respect to process of UD.

Chapter 3: Identification of established Parameters and Sub-parameters

These chapter carries forward the parameters of Vitality, Liveability and Sense of Place and determines the relevant parameters and sub parameters related to transformation of CC and process of UD in a city through expert opinion surveys. The related sub-parameters are further investigated to derive relevant variables for further exploration in the following chapters.

Chapter 4: Case Study

This chapter introduces the study areas from the perspective of transformation of CC that have occurred recently in the city of Kolkata. Similar cases of CC in Kolkata in the form of markets and malls have been carried out with the help of a framework of parameters, sub-parameters and variables derived from Chapter 3.

Chapter 5: Discussion and Interpretation of Results

This chapter analyses the data collected through case studies and mathematically interprets the relationship between transformation of CC and process of UD in a city. It creates a relationship each for Vitality, Liveability and Sense of Place which determines the minimum requirements for each parameter to be attained for successful urban transformation regardless of the typology of CC.

Chapter 6: Conclusion

This concluding chapter highlights the issues related to current trends of transformation of CC in cities like Kolkata, contributions made towards creation of successful CC in cities like Kolkata and future directions of research generated through this thesis.

2.0 LITERATURE STUDY

2.1 Background

The following chapter explores relevant literature study regarding the keywords viz., Urban development, process of urban development, Commercial Centres and transformation of Commercial Centres, in case of cities. The study brings to light the various theories and academic discourse based on the subject and derives the relevant parameters of transformation of Commercial Centres with respect to process of Urban Development.

2.2 Urban Development

2.2.1 Evolution

Urban development is a constant ever-changing phenomenon which is responsible for transformation of cities from regional to local level. Studies on Asian cities by the Asian Development Bank (2018) have revealed factors like physical, social, economic, environmental, infrastructural, digital etc. as dimensions for understanding of urban development. Historically there have been evidences of formal city formations since ancient times. Centres of trade became the main driving forces of city development. Today they have become key to massive economic development policies all over the world.

The advent of the 21st century, global urban development trends generated a different direction to city and urban development. Globalisation brought in foreign trade and induced migration causing cities to expand rapidly. Cities transformed to mega-cities and global cities especially in Asia giving rise to rapid development in countries like India and China. In 2010, both countries have surpassed the USA in total world output. Urbanisation contributes nearly 60% to India's Gross Domestic Product (GDP) (NITI Aayog, 2021). India along with Nigeria are projected to have 37% of the increase of nearly 2.5 billion urban population growth during 2014-2050 (Yeboua, K., Cilliers, J., & le Roux, 2022)

In India, the development was first focused heavily on infrastructure development which was projected to bring about economic development (Sarma,1958). This direction of development provided for opportunities for large scale commercial developments across all major cities. Along with megacities and urban agglomerations, secondary cities also developed which formed the basis of poly centric urbanization. These secondary cities are performing a vital role in case of production, governance, and logistical functions at the sub-national or regional level (Sarkar, 2020).

In the last decade, the policies changed towards integration, resilience and digitisation. This resulted in schemes like transit-oriented development, rapid city extension projects, infrastructure development, development of commercial corridors etc. As a result of this process, CC integrated with the other city infrastructures became popular. All major cities in India introduced the mall typology as a response to this development process. New city extensions like New Town, Rajarhat near Kolkata, GIFT city, Gujarat, Airport City, Hyderabad etc were develop. Along with new city extensions and introduction of new building typologies, a major drive for city renewal and regeneration was formulated. Commercial development has been one of the areas that have undergone transformation because of varied processes of Urban Development.

2.2.2 Salient Features

The Salient features related to Urban Development as seen in Literature are as follows:

a. Urban development is manifested in the city by means of changes in the rate of urbanisation of the city. Urbanisation patterns in any urban area can be manifested by the following three parameters viz., property type in existing urban areas, complexity of existing urban areas and size of the urban area (Zhou et. al., 2020). Hierarchy of the urban centres, functional districts and administrative divisions that define Urban Development are based on size of population. This was influenced by the availability of land, resources and economic opportunities in the region.

b. In India, definition of an urban area given by the Census (2011) states that an area can be called urban if fulfils 3 criteria simultaneously, viz.,

    i. A minimum population of 5000.

ii. At least 75 % of working population engaged in non-agricultural pursuits.

iii. A density of population of at least 400 per sq. km.

In accordance with the Census data of 2011, India is home to 7935 towns and cities which have risen from 5161 towns and cities in 2001 (Census 2011). The projected urban trajectory of India postulates that out of a population of 1210 million in 2011, 377 million live in urban areas (Census 2011, McKinsey 2010). By 2031, this will be increasing to 1440 million with 600 million residing in urban areas. The million plus cities currently standing at 53 will increase to 78 (Census 2011, McKinsey 2010). There were 3 mega-cities viz. Greater Mumbai (18.4 million), Delhi (16.8 million) and Kolkata (14.1 million) which were included in this change (McKinsey 2010). This is a considerable growth rate with staggering implications on the urban space and form of cities and quality of life. The 44% growth rate of urban population and 29.5% reclassification of rural settlements into town in Census 2011, was due to a large migration of population in search of jobs and economic upgradation. This determines economic development as one of the directions for Urban Development in the country.

c. In India, the Ministry of Housing and Urban Affairs (MoHUA, Government of India has executive authority over the formulation and administration of the rules and regulations and laws relating to the housing and urban development in India. The Ministry with their various departments lay down policies, legislations, and development programs etc. for future growth. Town planning departments operating at the state level prepare master plans and development plans. The urban planning process is same throughout the country following the guidelines stipulated in Urban and Regional Development Plan Formulation and Implementation (URDPFI, 2015). The processes determined by the organisations shape cities and their futures.

d. Urban Development processes in India have followed the polycentric development strategy taken by various nations to support urbanisation. This has triggered rapid urbanisation in cities in India leading to growth of cities at a massive scale. Based on qualitative factors, population diversity, status of the city and level of development cities in India have been classified as Tier-1 (Metropolitan cities -Mumbai, Delhi, Kolkata, Chennai, Bangalore and Hyderabad, Census, 2011), Tier-II (Regional centres

or State Capitals or major ports like Pune, Jaipur, Lucknow, Kanpur, Trivandrum etc., Census, 2011) and Tier-III consists of minor cities (Census, 2011) (Mahfooz, 2013).

e. The policies of MoHUA directed towards Urban Transformation are namely, Pradhan Mantri Awaz Yojana (PMAY), Jawarharlal Nehru National Urban Renewal Mission (JNNURM), Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Smart City Missions, Green City Initiatives, various Urban Transportation policies, Urban Infrastructure development of Satellite towns and 7 megacities, Swachch Bharat Mission and National Mission on Sustainable Habitat (NMSH). Each of these policies have investigated betterment of quality of life in cities. One of the directions for development has been economic growth.

f. In the last decade, commercial development has been on the forefront which has been substantiated by infrastructural and industrial development. Delhi Masterplan 2021 focussed on transit-oriented development which rapidly increased the FAR along the major transit corridors facilitating Commercial and Mixed-Use development. Kolkata and its surrounding agglomeration area was planned with the basis of polycentric urban centres. City expansion in the form of satellite towns and city extensions added to the multiplicity of urban centres. Urban renewal policies like JNNURM, AMRUT, Smart City Missions, Green City Initiatives and NMSH have influenced development in the new city extensions with new Commercial projects. Commercial Development constructions with respect to projects for operation and management of townships, malls/ shopping complexes and business centres are permitted to be funded by 100% FDI according to the FDI policy of 2020.

2.2.3 Inferences

The major inferences are as follows:

- There has been unprecedented growth in cities especially in India. Multiple city types have developed with rapid city expansions.
- With the advent of polycentric urbanism, it has been apparent that various urban centres have been developed with a focus on commercial development.

- This has brought with it new urban spaces which are in stark contrast to the Indian city making it crucial to devise methods to integrate these transformations seamlessly within the urban fabric.

2.3 Process of Urban Development

2.3.1 Evolution

Process of urbanisation has been the crux of Urban Development. Historically, it has been seen that any shift in power and change of governance has effected change in process of Urban Development. It determines extent of growth and progress of a city. Over time, several processes have been put forward by theorists to attain specific paths of progress.

Walter Christeller (1933, 1966) in his theory of central places postulated one nucleus or a centre of economic or administrative activities like market hubs, transit nodes and administrative districts are the main nucleus for city development. August Lösch (1940) developed the equilibrium concept regarding the system of locations of economic activities. E.M. Burgess and H.Hoyt (1939) proposed various functional zones around the nucleus of Christeller called 'Central Business District'. Central Business Districts (CBDs) currently stand for multifunctional hubs for commercial, institutional and recreational activities. The most prominent CBDs of these cities were of four kinds viz., administrative centres, Commercial centres, Production or Industrial centres and Religious centres.

As urbanization progressed giving rise to metropolis and megalopolis the idea of the central place started to give way to a new theory. C.D. Harris and Ulman (1945) further defined the model by proposing multiple nucleuses for a single city. Polycentric urban development impacts spatial changes in the urban pattern, land use and land value. This in turn brings about 'structural changes in city forms' (Hill, 2004; Defries, 2008; Bhatta 2009; Ramchandra 2012). 'Six main activity centres' of the late 20th century city has been derived that create 'a new polycentric urban form' (Hall, 1999). They are as follows:

a) The "Traditional Business Core"

b) The "Secondary Business Core"

c) The "Tertiary Business Core"

d) The "Outer Edge City"

e) The "Outermost Edge City"

f) Scattered "Specialised Concentrations Of Activity"

It is seen that Commercial activities thus are one of the central elements impacting process of urban development.

In the Global South, with rapid urbanisation, polycentric growth has been most popular. China adopted to develop multiple post cities with economic development like Hangzhou, Beijing, Shanghai etc (Gaubatz, 1999, Lan, 2020). 'In Jakarta, developers employed landscape and design consultants from Western cities to create similar urban landscapes to that in the West' (Dick and Rimmer, 1998). India focussed on developing 63 cities through the JNNURM scheme focussing on 'focus on inclusive development of urban centres' (Kundu, 2014). In the national level, driver of urban growth is diversity and concentration of economic activity in cities (Kundu, 2014).

Urban agglomerations served as focal points of a mechanism for generating economic surplus in India e.g. Chennai (Madras), Kolkata (Calcutta), Mumbai (Bombay) and Delhi. The urban policy in India is largely regulated by the Centre. The Centre can, at the most, "issue directives, provide advisory services, set up model legislation and fund programmes" (Shaw,1996 & Batra, 2009). The policies undertaken by the Centre has greatly affected the process of UD in the various states. Post-Independence, the first phase of UD from 1951-1966 happened after partition when rapid in-migration created shortage of housing and basic infrastructure. The Five-Year Plan during this time focused on rehabilitation and provision of housing leading to the formation of rehabilitation colonies and sub-towns around the major cities like Delhi, Bombay, Ahmedabad and Calcutta. Another major trend of urban development during this time was rise of industrialization. Companies like TISCO tried to solve the dual problem of housing and unemployment by creating jobs and providing housing for their workers at the same time. Through the consecutive Five Year Plans the major cities like Delhi, Mumbai, Madras set up their own Development authorities. Most of the cities followed the Westernised model of Master Planning to deal with the emerging urban problems. One of the salient features in this model was the formation of detailed modernised Central Business District. Along with this there were features of segregated zoning, slum free cities and efficient transportation system.

In the second phase from 1969-1984, there was a rapid increase in the development of small towns ensuring spatial allocation of economic activities to prevent over densification of the major cities. Development of Industrial towns, Educational towns and Commercial towns were seen.

In the third phase, the country aimed towards liberalisation of the economy bringing in private sector and opening opportunities for urban development. There was a major reorientation of policies towards creation of housing leading to implementation of satellite towns and cities, 329 cities were identified as GEMs (Generators of Economic Momentum) which were divided into national level and state level Priority centres (NPC and SPC). This created a network of nodes and corridors aiming at high level economic growth thus shifting from centralised system to decentralised system of urban development. One of the most Important decisions during this time was that the 74th Constitutional Amendment empowered the Urban Local Bodies to participate and develop their respective areas via urban planning.

With the turn of the century, the economic liberalisation paved the way for various policies that not only aimed at urbanisation but also urban renewal and urban transformation. The most important policies were the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in the 2000s, Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and Historic City Development and Augmentation Yojana (HRIDAY Mission) in the 2010s. This initiated incentives for more diversified and partnership-based approach to governance as opposed to the earlier centralised system. Economic potential has been taken up as a criterion of urban planning. New methods of land assembly, pooling and development triggered the development of city extensions aimed at uplifting the image of Indian cities on the Global stage. Creation of new city extensions like Gurugram, Delhi; Faridabad, Delhi; New Town Kolkata; Airport city Hyderabad; City extension in Bangalore etc are primary examples. Promotion of investments in real estate, Public-Private partnership mode of business, promoting mixed land use supported by self-financed and self-sustained urban development initiated the commercial centre creation in all major cities in India.

2.3.2 Salient Features

The Salient features related to process of Urban Development as seen in Literature are as follows:

a. **Urbanisation** causes **changes in land-use** from non-urban to urban uses and location of land determines the viability of the same. (Nuissl, H., & Siedentop, S. 2021, Chen, W., Zeng, J., & Li, N., 2021, Singh, P., Kikon, N., & Verma, P. 2017, Ramachandra, T. V., Bharath, H. A., & Vinay, S. 2013, Jauhiainen, J. S. 2006). The indicators for land-use change are size of land and creation of new urban land (Kolankiewicz and Bleck, 2001, Angel et al. 2005, Schneider and Woodcock, 2008, Siedentop and Fina 2010, Wolff et al., 2018), urban density and their changes, land-use mix, Concentration of centres or decentralisation (Galster et al. 2001, Glaeser and Kahn, 2003, Lopez and Hynes, 2003, Weber and Sultana, 2005, Huang et al., 2007, Torrens, 2008, Nuissl, H., & Siedentop, S., 2021) and complexity or 'spatial pattern of urban land use change in relation to the existing settlement area' (Chin, 2002, Huang et al., 2007, Schneider and Woodcock 2008, Siedentop and Fina 2010, Salvati, Carlucci 2016, Nuissl, H., & Siedentop, S.,2021). In recent years **decentralisation or polycentric urbanism** has been one of the directions creating urban change.

b. Polycentric Urban Development Process have shown that at the macro scale Population density and Land value (Bourne, 1989) are determined by **Urban Transformation, Land-use allocation** (McDonald and McMillen, 1990; Peiser, 1987) and **Location** (Shukla and Waddell, 1991,1993; Bourne 1989). In Literature, the common parameters influencing **Urban Transformation** with respect to the above factors were namely, **Vitality** (Jacobs, 1961, Ravenscroft, 2000, Bosselmann, 2012, Zaidin, et. al., 2015, Lang, Chen, & Li, 2016, Spina, 2019, Kim, 2020, Liang , D'Uva, Scandiffio, & Rolando, 2022, Paudel, Pant, 2023), **Liveability** (Bosselmann, 2012, Ellis, Roberts, 2015, Choon-Piew, 2016, Mendizabal, Heidrich, 2018) and **Sense of Place** (Gehl, 2011, Bosselmann, 2012, Ilgın & Hacıhasanoğlu, 2006, Demirsoy, 2006, Sepe, 2014, Beyhan, 2015, Frantzeskaki et al., 2016, Lee, 2018, di Masso et al. 2019, Brink and Wamsler 2019, Hölscher, 2021, Shamur, 2023). In recent times, polycentric development has resulted in New Planned Towns in India viz. New Town Kolkata, Gurugram, New Delhi, Airport City, Hyderabad, Navi Mumbai, Mumbai etc.

c. **Vitality** is one of the key factors that get influenced by Urban Transformation. 'Urban Vitality is of vital importance for the vibrant and sustainable urban development'(Lang, Chen, & Li, 2016). The vitality of economic centres is determined by publicness of spaces (Jacobs, 1961, Ravenscroft, 2000, Spina, 2019). Vitality of public places increase with the presence of public space supported by various activities (Montgomery, 1998, Gehl, 2011). Such public places around commercial centres are of 2 primary types – formal and informal. Higher percentages of formal and informal public spaces help in increasing activity and flow of people around new urban developments in cities, especial around Commercial Centres (Zaidin, et. al., 2015, Paudel, Pant, 2023).

d. Any Urban Transformation has altered the **Liveability** aspect of the urban area. It has been seen that those urban changes due to 'rapid urbanisation' affected the 'Liveability factor' in cities (Bosselmann. 2012, Ellis, Roberts, 2015, Choon-Piew, 2016, Mendizabal, Heidrich, 2018). Neighbourhood formation and theories have looked at 'liveability as the central pillar for resilient communities' (Mendizabal, Heidrich, 2018). Liveability describes the overall contribution of the urban environment that influences the quality of life or well-being of residents (Urbis, 2008, Martino, 2021). 'Policies that affect urban form also affect the Liveability of spaces' (Martino, 2021)**.** Currently, Urban Development policies are aimed towards making cities 'Economic Growth Engines' which are 'aiming at boosting their attractiveness' to companies at a global stage (Antonescu, 2017, Yi, 2021). 'Liveable cities' boost such attractiveness to create the environment for economic growth (Antonescu, 2017). There is a need for studies of such to be conducted in case of commercial urban centres in cities to understand the effectiveness of such centres.

e. With rapid urbanisation of cities, the aspect of **Sense of Place** has been affected causing changes in 'place identity in cities' (Bosselmann, 2012, Sepe, 2014, Lee, 2018, Shamur, 2023). Urban projects in the scale of urban design have always considered place making as an integral aspect for creation of public places (Gehl, 2011). 'Geographical characteristics, architecture, local traditions and lifestyles are the components completing the urban identity of a city' (Ilgın & Hacıhasanoğlu, 2006, Beyhan, 2015). It is 'important to save spatial meaning, abide by human scale and rate, strengthen the relationship between urban space and people' for successful Urban Transformation.

(Demirsoy, 2006, Beyhan, 2015)**.** This place-based approach for development works in local scale which immediately influences the quality of life and vibrancy of the urban space. Place-specificity recognises the particular role of 'sense of place' and 'place attachment', which can be an 'outcome of experimentation and in turn drive transformative change' (Frantzeskaki et al., 2016; di Masso et al. 2019; Brink and Wamsler 2019, Hölscher, 2021).

All the above are reflected in the policies determined at both International and National levels in the policies undertaken by various world organisations and countries. The concepts of development which are determining the process of Urban Development in the past decade have been discussed below.

At the international context. the United Nations Development Programme (UNDP) have defined Sustainable cities, Resilient Cities, Inclusive Cities, Smart Cities and the Sustainable Development Goals (Strategy 2030) as the different directions of Urban Development in cities over the years.

a. The Sustainable Development Goals (2015) put forward Strategy 2030, where Goal 8 (Sustainable Economic growth) and Goal 11 (Sustainable Cities and Communities) work towards upgradation of quality of work and life through inclusive, resilient and sustainable measures through **Urban Transformation** (SDG Strategy 2030, United Nations). Various cities in the world are working towards these goals. According to the City Resilience Index of the UNDP (2021), '**Economy and Society'** is one of directions for development with focus on '**attractive business environment and integration of global and local economies.'**

b. The Smart Cities Initiative (2021) approach addresses the 'challenges faced by cities due to rapid urbanisation' and looks towards 'enhancing the **liveability of cities** and **quality of life**.'

c. The Asian Development Bank recognised 'Urban Transformation' as a way towards 'enhancing **liveable cities** across Asia and the Pacific' (ADB, 2019). They have also focussed on the need for 'prioritizing systemic benefits and improvement in the **quality of life in cities'** (ADB, 2019, 2015).

d. Mayors for Economic Growth (M4EG, 2023) focusses on '**economic development'** through 'people powered policies' for making '**liveable cities**.' Models looking

development via '**public investment and commercial activity'** from 'large-scale to local scale projects' have been proposed.

Each of the directions of development (Table 2-1) are looking towards enhancing the **vitality, liveability and quality of life of cities**. Each of these **directions have economic development** as one of the means to achieve the same focussing on creating **viable business environment** through the **process of Urban Transformation**.

Sl.No.	Development Direction/ Goal/ Initiative/	Agency	Concepts of Development explored	Examples
1.	Sustainable Development Goals	United Nations	Urban transformation Liveable cities	Japan , India, European Union, China, Ukraine, Philipines, Moldova, Nigeria etc.
2.	City Resilience Index	UNDP	Urban Transformation Liveability Resilient Cities	India, South Africa, Mexico, Chile, USA, UK, Denmark, Tanzania, Indonesia etc.
3.	Smart Cities Initiative	UNDP	Urban Transformation Digital Transformation Public places for people	China, Nigeria, India, South Korea, Indonesia, South Africa etc
4.	Urban Transformation in Asian Cities	Asian Development Bank	Urban Transformation Liveable cities Public places and Urban Vitality.	Singapore, Jakarta, Hongkong, Manila, Ahmedabad, Delhi, Kolkata etc
5.	Mayors for Economic Growth (M4EG) – Co-Creating urban Transformation	European Union, UNDP	Urban Transformation Economic Development Liveable Cities	European Union, Ukraine, Turkey etc.

Table 2-1: Major policies are guiding the direction of Urban development in the World and the directions of development explored. (Source: Various, Compiled by Author)

At the national context, the following major policies are guiding the direction of Urban development in India in the past 2 decades.

a. JNNURM (2005), a mission mode programme, aims at creating 'economically productive, efficient, equitable and responsive Cities' by a strategy of 'upgrading the **social and economic infrastructure in cities**.' The policies look primarily at 'Urban Infrastructure and Governance' and providing 'Basic Services to the Urban Poor' (JNNURM, 2005).

b. Smart Cities Mission (2015) aimed towards '**liveable, sustainable and has a thriving economy** offering multiple opportunities to its people to pursue their diverse interests.' This policy has been used to create '**vibrant public spaces**' and '**revolutionise placemaking'** in Smart Cities in India focussing on vitality. Currently the policy has looked at 100 cities. Some of the Policies aimed at Urban transformation are Streets for People Initiative, Ease of Living Index, Municipal Performance Index, City GDP Measurement Framework, Climate Smart Cities, City Investments to Innovate, Integrate and Sustain Challenge (CITIIS) etc. 'Streets for People Initiative' involves development of data-based transformation for **enhancement of Liveability**. Commercial streets, Market areas, recreational corridors and high footfall areas have been considered as potential flagship projects areas. The Ease of Living Index (EOL) 2019 assesses 'Quality of Life, Economic Ability and Sustainability' in cities. One of the pillars to access 'Economic Ability' is 'Level of Economic Development' through development of 'Trading Clusters.'

c. AMRUT (2015) Scheme looks at development of 'basic infrastructure' of 'selected towns and cities'. One of the sub schemes was to develop open spaces and public spaces promoting **Urban Vitality**. AMRUT 2.0 (2021) focusses on water security and 'transformation and rejuvenation of water based public spaces.' Focus area has been fixed at '500 cities' in the country.

d. HRIDAY (2015-2019) Scheme targets heritage cities towards development of physical, economic, social and institutional infrastructure in heritage sensitive cities. 12 cities in the India had been year marked under this Scheme. **Revitalisation of heritage commercial cores** have been one of the aspects of this scheme.

e. National Mission on Sustainable Habitat (NMSH)(2011, 2013, 2015) alternatively known as National Action Plan for Climate Change (NAPCC) looks towards 'creation of healthy environment for Indian cities' in accordance with the Sustainable Development Goals put forward by the UNDP. This focussed on 'sustainable urban development' and reduction of energy consumption in all aspects of the urban planning process. For e.g. 'large commercial projects and planning need to adhere to climate sensitive bylaws' to reduce emissions.

Sl. No.	**Development Direction/ Goal/ Initiative/**	**Agency**	**Concepts of Development explored**	**Examples**
1.	JNNURM	MoHUA	Urban Transformation Infrastructural and Economic Development. Basic Services to the Poor	Chennai, Mumbai, Hyderabad, Delhi, Kolkata, Pune, Surat, Vijaywada etc.
2.	Smart Cities Mission	MoHUA	Urban Transformation Liveability in Cities Placemaking and Vitality Quality of Life Digital Transformation	100 Smart Cities (Delhi, Kolkata, Jaipur, Coimbatore, Tiruchirapalli, Hyderabad, Shimla etc.)
3.	AMRUT	MoHUA	Urban Transformation Infrastructure development Public places for people	500 Cities
4.	AMRUT 2.0	MoHUA	Urban Transformation Water Security Water based Public Spaces	500 Cities
5.	HRIDAY	MoHUA	Urban Transformation Heritage city development Revitalisation Economic Vitality	12 cities
6.	NMSH	MoHUA	Sustainable development Urban transformation Urban Planning	500 cities

Table 2-2: Major policies are guiding the direction of Urban development in India and the directions of development explored. (Source: Various, Compiled by Author)

From Table 2-2 it can thus be seen that **Urban Transformation and rejuvenation** have been considered as the development processes focussing on **Vitality, Liveability, Sense of Place** and **Economic Development aided by viable commercial activity**.

Combining both Table 2-1 and Table 2-2, it can be seen **Urban Transformation** is the most common process of Urban Development which primarily has affected the **Vitality, Liveability and Sense of Place of Cities**. It can also be seen that **economic development and promotion of commercial activity** are one of the focus areas in cities around the world.

2.3.3 Inferences

The major inferences are as follows:

- Urban processes have shaped the development of cities historically.
- The most common type of development in the past decade has been polycentric development which have resulted in rapid urbanisation creating large urban agglomerations.
- Urban Transformation is one of the most popular methods of mitigating rapid urbanisation and its challenges both at the International and National contexts.
- Economic development has been one of the major driving forces in city development especially in cities of India and have undergone major transformation.
- The most common parameters affecting urban transformation are Vitality, Liveability and Sense of Place.

2.4 Commercial Centres

2.4.1 Evolution

In the early urban phase of civilisation, city centres were dominated by centres of power which were political or religious. Most of the centres were built around the temples of the period. In Europe the earliest civilisations with CC dates to the Minoans of Crete around 2700 BCE. Designated marketplaces known as Agoras were found in Greek city states around 600 BCE in Athens, Corinth, Miletus and Priene. The Athenian agora in 500 BCE, was both a commercial

and a political space and became the centre of the city replacing Acropolis which was the religious centre. Around 715-800 BCE the Roman Forum developed as the city centre like Agoras. Around Europe, medieval towns showed the presence of central plazas, which have now developed as city centres like Hauptmarkt, Nuremberg, Germany.

In the 1800s, colonisation increased trade between Europe and the rest of the world which led to the development of the typology of Exhibition Buildings. These were called Fair Buildings, as seen in the Crystal palace in London, England. This marked the internalisation of the markets in Europe which was a strict departure from their medieval counterparts. Later in America, there was an advent of shopping malls of various shapes and sizes. Popular amongst them were the Big Box malls which were like giant boxes which stored products of all available choices in aisles. The customer was free to choose products on their own with no concept of shopkeepers. Only billing was done at the end which involved store managers. Local versions of such malls were known as departmental stores. These have now become popular in countries all over the world.

In the East, markets date back to the first civilisations in Indus Valley cities around 3000 BCE. It was believed to be situated on a wide street with workshops lining the edge of the street known to be urban markets. (Kenoyer, 2008). These markets were situated in Dilmun, Magan, Meluhha, Harappa, Dholavira and Mohenjodaro. Around 1500-600 BCE the *Rigveda* records intense buying and selling activities and presence of bargaining as a means of interaction during the process. Around 550 BCE, there are records of a permanent marketplace with colonnaded open markets adjacent to the religious institutions in pre-Islamic cities. Though the marketplace had a designated area, the shops were still temporary making it accessible to different traders (Bird, 2013). The book *Arthashastra* written around 200-300 CE, by Kautilya, mention specific areas for traders and shops along the north-west direction. The *Manasara* written during 500-700 CE mentions guidelines for planning of commercial areas in both villages and cities. There are also mentions of different city typologies of which the '*Pura*' is Vedic equivalent of a trading city. Various cities in southern India flourished during this time due to compatible inland trade and maritime trade relationships with China, South-East Asia and the Gulf. Like Hampi, Vijaynagara Empire, Cochin, Madras, Calicut etc. The word "market" originated from 'Kannada word "*marukatte*" (meaning a platform for selling commodities)' (Katti, 2015), Hampi bazaar streets are considered as one of the first attempts at organised marketplaces in India.

Meanwhile in North India, with the arrival of the Sultanate, trade connections with Persian and other Middle Eastern countries strengthened. The Mughals in the 1400s enriched this trade relationship making Mughal India the world's largest economy by the 1700s. Markets of Delhi, Agra and Lahore (part of Mughal India) were famous worldwide. The city markets were part of the walled city centres and were primarily the anchor streets connecting mosque with royal palaces or forts. Notable among these are Sadr Bazaar, Chandni Chowk and Chatta Bazaar. Chatta Bazaar is notable as a prolific covered markets in India. It was situated at the public entrance for Red Fort and was composed of a street lined with shops and a centrally located atrium. It made for a vibrant entrance to the fort and continued into Chandni Chowk where the commercial street leads up to Fatehpuri Mosque. At a similar time, the Hindu kingdoms of northern India also were richly developed. The city of Jaipur was a planned grid iron settlement with defined nodes called *chowpads*. Central road with the biggest *chowpad* was the CC and all neighbourhoods in this area were commercial in nature.

By late 1800s, the British settled in the country and made Calcutta their capital. The connectivity of the city to hinterland by both land and water ensured trade. The settlement of various British officers prompted the development of Hogg Market in 1893. This was a covered market and had an internal network of streets. Earlier this market housed only perishable goods and freshly made food and produce but around the early 1900s the cloth traders also set up shop within this market.

Post-independence, Indian markets went through a series of changes. The municipal corporation markets around the cities were established. These were two storied market buildings with provision for selling perishable, non-perishable, essential and non-essential goods. These were supported by the informal market along the edges. Later, in early 2000s, with globalisation came the concept of shopping malls. These have flourished till date with the liberalisation of economic policy and adaptation of westernised concepts of lifestyle in most Indian cities.

2.4.2 Salient Features

The Salient features related to process of Commercial Centres as seen in Literature are as follows:

a. CC have played a deterministic role in the shaping of a city. The location and functions of CC have determined their hierarchical significance in a city. Weinstein (1974) developed three dimensions instrumental in shaping a conceptual model for an Indian city. These were:

   1. Socio-economic dimension symbolised by the bazaar. E.g. Shahjahanabad, Agra, Kolkata, Bangalore.

   2. Political dimension represented by an administrative symbol. E.g. Delhi, Kolkata, Agra, Chandigarh.

   3. Prestige dimension derived from the religious function of a temple. E.g. Thiruvananthapuram, Madurai, Shajahanabad.

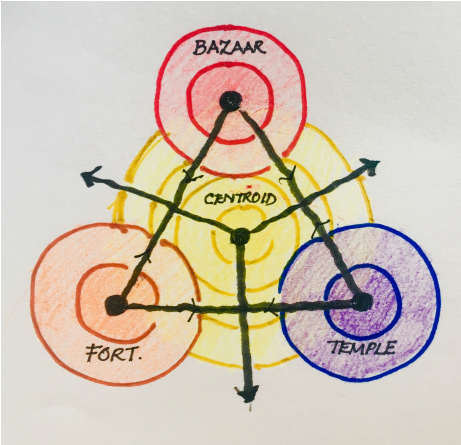


Figure 2-1: Traditional Islamic City Model.(Source: Sarkar, S., et. Al., (2020). Transformation of Commercial Centres and Urban Development Process in Global South. Perception, Design and Ecology of the Built Environment: A Focus on the Global South, 51-64.)

b. Christopher Alexander (1977) classified Commercial Centres based on hierarchy. They were Central Business District, Small Business district, Regional Shopping Centres and Neighbourhood Centres. Commercial centres can be classified based on various parameters like ‘size, distribution pattern and type of goods’ (Guy, 1998). In accordance with distribution typology, Commercial Centres can be divided into ‘formal

markets like wholesale markets & retail markets and informal markets' (Guy, 1998). This thesis is focussed on the transformation of Retail Commercial Centres. Based on type of goods, Retail Commercial Centres has been classified by different countries. In United Kingdom, the goods are classified as Convenience goods, Comparison Goods, Recreational Goods and Others (Retail Planning Information, 1994).

In India, traditionally retail commercial centres were classified into two types based on availability of goods and services and morphology of markets. These are:

i. **Traditional retail markets** - These markets are the typical market streets which are lined with shops. The perishable goods are sold in informal shops on streets and slabs inside the market premises.

ii. **Modern retail markets** - This type of market typology was new and could be classified further into the following building types.

- Branded stores - Exclusive showrooms either owned or franchised by manufacturer.
- Specialty stores - Stores based on specific consumer demand containing most popular brands.
- Departmental stores - Large stores having a variety of products organised into different departments.
- Supermarkets – Major self-service retail outlets.
- Discount stores – Discounts offered on retail price through selling high volumes.
- Hypermarkets – Mega scale supermarket situated in quieter parts of the city.
- Convenience stores - Small neighbourhood stores located in crowded urban areas.
- Shopping malls - A complex having different versions of in-store retailers all under one roof.

c. With rapid development of various types of CC around the cities there has been attempts to distinguish a hierarchy for them. In this regard, hierarchy for Commercial Centres based on the URDPFI, 2015 guidelines are given in Table 2-3. Based on this, the Master Plan of Delhi (2021) devised a five tier Commercial Centre hierarchy for the city. In Chennai, though focus of development is based on industrial aspect, it has been supported by promoting sufficient commercial and mixed-use residential land-use. This trend of polycentric commercial development is widely followed across the county. These specific directions in all these cities have guided the transformation of CC and opened them up to rapid implementation of modern retail markets.

Table 8.60: Hierarchy of Commercial Centres (NBC)

Sr. No.	Planning Unit	Class of Settlement			Population served	Hierarchy of Commercial Centre
		S	M	L		
1	Housing Cluster	✓	✓	✓	5000	Convenience Shopping
2	Neighbourhood	✓	✓	✓	15000	Local shopping centre
3	Community	✓	✓	✓	100000	Community Centre
4	District	-	✓	✓	500000	District Centre
5	Sub city	-	-	✓	25 lakh - 50 lakh	Sub city Centre
6	City	-	-	✓	50 lakh +	City Centre

S: Small Town
M: Medium Town
L: Large City, Metropolitan City and Megapolis

Table 2-3: Classification of Commercial Centres (Source: NBC and URDPFI, 2015)

d. Components of a typical CC in the community level are Retail Shopping, Commercial and Offices, Cinema, Cineplex, Hotels, Restaurants, Banquet halls, Guest House, Clinic & Poly Clinic, Police Post, Post Office, Bank, ATM, Informal Trade, Multi-level parking (URDPFI, 2015). Among this specialty stores, departmental stores, convenience stores and shopping malls have become popular in cities like Delhi, Mumbai, Kolkata (Pattanaik, 2013, Naidu, 2016, Tandon et. al, 2016, Mitra et. al, 2022) which have overtime 'changed the shopping behaviour of consumers' (Naidu, 2016, Tandon et. al, 2016, Mandeli, 2019, Roy,Ray, 2019). Specialty stores like Big Bazaar, Spencer's etc. along with their convenience store versions like Easy Day Club and More have become widespread all over the country.

Table 8.61: Norms for Commercial Centres

Sr. No.	Category	Population Served per unit	Land Area Requirement
1.	Convenience Shopping	5,000	1,500 sqm
2.	Local shopping including service centre	15,000	4,600 sqm
3.	Community Centre with service centre	1,00,000	5 Ha
4.	District Centre	1 at District level / 5,00,000 population	40 Ha
5.	Sub-city Centre (UDPFI)	25 lakh to 50 lakh	As per requirement
6.	City Centre (UDPFI)	50 lakh +	As per requirement
7.	Local Wholesale Market/ *Mandi*	10 lakh	10.00 Ha
8.	Weekly Markets	1 to 2 locations for every 1 lakh	Area per location = 0.40 Ha

Table 2-4: Norms for Commercial Centres. (Source: URDPFI, 2015).

e. Existing marketplaces are also undergoing physical changes due to the new shopping centre typology inducing new shopping behaviour in customers (Naidu, 2016, Tandon et. al, 2016, Saha et. al., 2016, Mandeli, 2019, Roy,Ray, 2019). Some projects under the AMRUT scheme and Smart City missions include redevelopment of existing commercial spaces, market complexes and commercial public spaces (smartcites.gov.in, 2023). Cities like Delhi, Kolkata, Jaipur, Coimbatore, Tiruchirapalli, Hyderabad and Shimla have already implemented such projects. Redevelopment of Khan Market with proposed 7 storied commercial complex, Sarojini Nagar Market Redevelopment, Development of Market Complex in Tiruchirapally are some examples of the same.

f. In all cases, urban transformation changed the kind of activities comprised within the CC and was determined by the population and area of influence of CC. With increase in scale detailed Urban Design and Landscape Schemes are required to integrate transportation systems to activity areas in city centre (MPD-2021). Focus on public spaces, continuity of public realm, ease of accessibility and sustainability in areas of commercial or institutional nature have also been advised (MPD-2021). Even though the building typology, scale and activity components have evolved, the focus of CC as public places of the city has only been reinforced.

2.4.3 Inferences

The inferences related to CC are as follows:

- CC have played a deterministic role in the development of cities.
- With rapid development of cities, CC underwent changes in scale resulting in creation of hierarchy of CC in cities.
- Modern CC evolved into multifunctional public places with a varied spectrum of activites and amenities. This changed the usage pattern of consumers with respect to markets and commercial areas.
- There is greater focus on projects related to transformation CC as public places of the city promoting economic activity and enhancing the quality of life.
- It is required to understand such types of transformation and a possible method to measure or predict the change to facilitate future development.

2.5 Transformation of Commercial Centres

2.5.1 Evolution

As previously discussed, CC have undergone transformations both in the Eastern and Western part of the globe. A comparative study of transformation patterns of CC reveals a kind of pattern in both spheres.

The pattern of commercial buildings has changed from being open spaces and streets to enclosed buildings. Unplanned marketplaces were organised into planned shopping arcades. In the Western context, CC were originally started as central urban places within the settlement with accessibility to the centre. These areas were central open spaces or plazas. The Agoras of Greece, the Roman Forum and even medieval European towns and cities follow the similar pattern. The central location of the marketplaces made them not only CC but turned them into urban centres. Renaissance saw cities emerge like grand centres. The cities developed pliable streets and shops developed along these streets. They developed as arcades along these streets leading to the plaza which was the main centre of shopping.

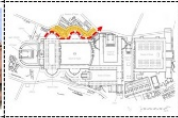
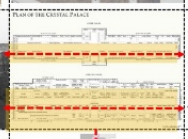
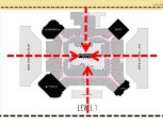
SL. NO.	TIME PERIOD	TYPE/ PLACE	IMAGE	URBAN FORM	URBAN CHARACTER
1	600 BCE-100 CE	**Agora-** Athens, Greece.			1. **Central location**, most important place. 2. **Open space as market**, no defined shops. 3. **Temporary shops.** 4. **Pathways** enclosing the space.
2	715 BCE-800 CE	**Forum**-Trajan's Market, Forum of Trajan,Rome, Italy .			1. Located **adjacent to Political Centre**. 2. **Ordered , colonnaded double-storey** commercial space. 3. Both **Temporary and permanent** shops.
3	1200 CE-1500 CE	**Medieval market-** Hauptmarkt, Nuremberg, Germany .			1. Located in the **centre of city.** 2. Central space for **everyday goods – Temporary shops.** 3. **Ground floor** of adjacent buildings and streets - **Permanent shops.**
4	1500 CE-1800 CE	**Shopping Archade-** Galleia Vittorio Emmanuelle II, Milan,Italy.			1. Located **near Religious Centre of city.** 2. **Roofed Streets** -One commercial building. 3. **Colonnaded arcade** along perimeter. 4. Commercial **types-retail, office and hotel.**
5	1800 CE-1970 CE	**Fair Building -** Crystal Palace, England.			1. **One single building concept.** 2. Glass exterior-**distinctive façade** 3. **Linear movement** within building. 4. Exhibitions and events held.
6	1970 CE-2019 CE	**Shopping malls –** Mall of America , Minnesota ,USA.			1. Located in **commercial zones**. 2. **Single building** - multiple functions. 3. **No relationship to context.**

Table 2-5: Analysis of Commercial Centres in the Western context. (Source: Compiled by Author)

From 1800, increase in trade in a global scale led to formation of Fair and Exhibition Buildings. This introverted building typology had no functional connection to the outside public space which meant that it necessarily did not need to be placed in context of a CC or marketplace. The Crystal Palace in London was one of the most relevant examples during this time. In the next century, another introverted building called shopping malls were the commercial building type that emerged in the United States and spread across the world due to globalisation as the theme for urban development. The most important factor that this building type created was detachment from the surroundings. The Big Box malls could be placed anywhere near or around a town and it was aided by the car centric nature of cities and towns. The loss of the publicness of malls is a stark contrast to plazas and marketplaces of the past.

The Eastern context of India, marketplaces have been around since the Indus Valley Civilisation. Unlike the West, marketplaces here are linear in formation which formed the central spine of the settlement. The ease of access was paramount as their linear streets connected the most important public buildings of the settlement. Throughout time, the market street became the most important feature of CC. The Vedic mandis and the planned Gupta

period markets by Kautilya all features the linear market streets. The functional advantage of the streets ensures equal frontage spaces, ease of access, increased interaction between the customer contributing to the publicness of space. This form also supports a symbiotic relationship between formal and informal shops thus adding to the vibrancy of the shopping streets. Similar formation was used in the Islamic marketplaces with reintroduction of organised and regulated commodity prices and covered marketplaces in some areas like Chatta Bazaar, Red Fort, Delhi.

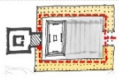
SL. NO.	TIME PERIOD	TYPE/ PLACE	IMAGE	URBAN FORM	URBAN CHARACTER
1	3300 BCE-1900 BCE	**Indus Valley market**-Dholavira,Gujarat ,India			1. Markets located along **central streets**. 2. Connected to **palaces or religions centres.** **3. Shops/workshops** as a part of **residential buildings.**
2	1500 BCE-500 BCE	**Vedic mandis**-Kashi,UP,India			***1. Vaishya* zones as markets - streets.** 2. Households produced their necessary goods. **3. Mandis in open spaces**
3	300CE-500 CE	**Gupta period markets-** Pataliputra, Bihar,India			1. Trade flourished-**markets with guilds.** **2. *Vaishya* zones permanent shopping** streets - **Trader community based.** **3. Periodic temporary markets-everyday.**
4	500 CE-700CE	**Pura**-Hampi, Karnataka,India			**1. Market Towns** - regulated markets. **2. Located near palaces or temples.** **3. Arcade streets** around public places.
5	1300 CE-1800 CE	**Islamic Bazaars-** Meena Bazaar, N.Delhi, India			1. Located in **city centres-** mosques and/or forts. **2. Market hierarchy**-Central, Regional and local. **3. regulated market streets** along traders residential areas. **4. Covered and open market streets.**
6	1700 CE-1900 CE	**Chowks**- Badi Chowpad, Jaipur,India			**1. Planned market zones** - trader residential areas. **2. Chowks** - major street intersections to **increase shopping frontage.** **3. Internal streets** follow Islamic market typology.
7	1874 CE - 1950 CE	**Colonial marketplaces** - Hogg Market, Kolkata,WB, India			1.Located at **the city centre.** **2.Covered market** typology 3.Multiple **variety of goods** under 1 roof. 4.Adjacent **streets as extension of the markets.**

Table 2-6: Analysis of Commercial Centres in the Eastern context. (Source: Compiled by Author)

Traditional markets developed from just places to market towns and developed a hierarchy. The location, types of goods and commodities sold and ease of accessibility were important features of these marketplaces. The surrounding streets became supporting market streets segregated based on the kind of commodity sold. These marketplaces had a mixed nature of functions which added to the complexity. Even with the rise of colonial towns and cities, the covered marketplaces were essentially a network of streets within the marketplace. Post-Independence the Municipal markets still followed the traditional format of marketplaces. But with the turn of the century, the Western Mall was introduced as a commercial building type

the concept of which was contradictory to the traditional markets. This juxtaposition on the surrounding public space caused a lack of activity and changed the nature of the public realm related to CC. The internalised form of the mall was initially even rejected by the cities. In the past decade, with the increased commercial investments and global image building, Central business districts were built and Malls formed the essential commercial building component. The challenge is to make the existing urban spaces cohesive with this building or vice-versa which could lead to creation of a compatible public space for the people.

2.5.2 Salient Features

The Salient features related to Transformation of Commercial Centres as seen in Literature are as follows:

a. To understand the factors determining Transformation of Commercial Centres, it is essential to understand the processes that have caused Transformation of CC. Through literature it has already been seen that urbanisation has been one of the primary reasons for Urban Transformation worldwide (Refer 2.3.2). 'Rapid decentralization and urbanization in cities caused the vitality of town centres to become an important discussion' (Ravenscroft, 2000).

b. Transformation of Commercial centres occurred because of gentrification (Hamnett, 2009, Bazzoli, 2015, Gant, 2015, Gainza, 2017, Bantman-Masum, 2020, Cho et. al., 2020, Forouhar, 2022), infrastructure development (JNNURM, 2015, Al-Thani, 2020, Lang, 2020), heritage based urban development (Gülersoy and Gürer 2011, Vural-Arslan, 2011, Gant, 2015, Rodríguez-Barcón, 2018, Santos-Izquierdo, 2023), changes in land use, changes in economic policies, urban regeneration (Vural-Arslan, 2011, Gant, 2015, Rodríguez-Barcón, 2018, Santos-Izquierdo, 2023), urban redevelopment etc. It has been seen, Urban transformation is influenced by Vitality, Liveability and Sense of Place (Refer 2.3.2) and vice versa in the process of Urban Development. The same need to be studied in case of Transformation of Commercial Centres.

c. Commercial Activities lead to urban consumption causing rise in economic **Vitality** of urban spaces (Maas, 1984, Lan, 2020). Commercial activities and their scales determined level of vitality of urban places enhancing pedestrian activity. As stated by Gonçalves (2020), 'new urban areas appeared or gained vitality when new stores were

opened'. Presence of 'mixed-use activities' (Jacobs, 1961, Istrate, Chen, 2022), 'related retail activities' (Maas, 1984, Mortazi Mehrbani et al., 2018, Nia, 2021, Istrate, Chen, 2022) and 'active edges' (Istrate, Chen, 2022, Nia, 2021, Montgomery, 1998) determine the economic Vitality of urban places (El-Khouly et. al., 2023, Nia, 2021). According to Montgomery (1998) concept of 'vitality is the main factor in determination of success of urban spaces.' Vitality and Liveability is enhanced by increased publicness of urban spaces by promoting accessibility (Lunecke, 2018, Montgomery, 1998, Maas, 1984, Jacobs, 1961).

d. **Liveability**, in case of Commercial Centres, means the ability of a centre to maintain and improve its viability and vitality (Balsa, 2004, Paul, 2020). Liveability is a factor thoroughly affected by 'Urban Transformation especially in Commercial Areas' (Maas, 1984, Gazi N, Abbas Z, 2019, Paul, 2020, Istrate, Chen, 2022). 'Presence of convenient shops, commercial facilities and schools' enhance the liveability in neighbourhoods (El Khouly et. al., 2023, Istrate, Chen, 2022, Wheeler, 2001). 'Inactive Commercial Centres' affect the 'liveability of the immediate urban neighbourhoods' (Hehir, 2019, Ghazi, 2019, Magdy Shafiq Mohamed, 2022, Ali, 2023).

e. **Sense of place** is a measure of the publicness of Commercial Centres. Place attachment is key to creating publicness in Commercial Centres which helps in fostering wellbeing in neighbourhoods (Ilkay, 2018, Turhan, 2020, Nambuge et. al., 2020, Istrate, Chen, 2022, Petterson et. al., 2023). In recent times, Commercial Centres like shopping malls have become refuge 'to avoid the harshness of public places and fast traffic' (Mandeli, 2019) making the new Commercial Centre typologies essential public places. 'Legibility and Sensory Experience' are instrumental in instilling 'Sense of Place of urban areas' (Jameson, 1991; Montgomery, 1998; Nia & Suleiman, 2017, Nia, 2021, Istrate, Chen, 2022). This has been seen in introduction and revitalisation of Commercial activity in urban areas enhancing Place identity (Nia & Suleiman, 2017, Nia, 2021, Istrate, Chen, 2022).

Some examples of projects facilitating Transformation of Commercial Centres and their effects are as follows:

a. At the National level, some policy level changes have triggered the transformation and upgradation of Commercial centres. As previously stated, policies like Smart City Mission and AMRUT have caused transformation of CC (Refer 2.4.2 e). Redevelopment of Infrastructural projects have also triggered new development of Commercial areas in vacant land (pib.gov.in, 2018). MOU between Ministry of Railways and Ministry of Urban Development states 'leveraging of commercial development of vacant land/air space in and around stations' in Tirupati, Delhi Sarai Rohilla, Nellore, Madgaon, Lucknow, Gomtinagar, Kota, Thane New, Ernakulam Jn. and Puducherry (pib.gov.in, 2018).

b. At the State Level, creation of new urban centres brought in transformation of CC. There has been an increase in creation of Commercial Real estate in the Tier I cities (Population 100,000 and above, Census, 2011). This trend has trickled down to the Tier II (Population 50,000-99,999, Census, 2011) and Tier III (Population 20,000 – 49,999, Census, 2011) cities (Taneja, N., 2022, Agarwal, 2022). Shopping malls, and business centres have developed rapidly in cities like Patna, Jaipur, Coimbatore, Tiruchirapalli etc (smartcity.gov.in, 2023). Studies have highlighted change in shopping pattern, urban place perception among the Indian consumers changing the liveability and sense of place. (Naidu, 2016, Roy, 2019, Taneja, N., 2022, Agarwal, 2022).

c. At the City level, introduction of Commercial projects have the power to create or destroy the Vitality, Liveability and Sense of Place of urban areas. For e.g. The City Centre Mall, Saltlake, Kolkata completed in 2004 has been successful in creation of public place in the otherwise residential city extension. It has triggered not only commercial development in its vicinity but brought in infrastructure development in the form of the Metro Rail enhancing all 3 aspects of vitality, liveability and sense of place in the area. In contrast, the redevelopment of College Street market has not progressed in the desired manner with the mall yet to be completed creating a loss of vitality in the areas around the CC (Nandi, 2021).

2.5.3 Inferences

The major inferences are as follows:

- Urban Development and its processes have caused transformation of Commercial Centres.
- Transformation of CC has steadily been taken as a process of development to expand economic prosperity of cities.
- Vitality of urban places have been affected by the transformation and viability of CC.
- Liveability of cities and neighbourhoods have been affected by transformation of CC.
- Sense of Place of urban areas have been affected by transformation of CC due to alterations in place identity and attachment.
- The 3 major parameters of affecting transformation of CC with respect to process of UD can be determined as Vitality , Liveability and Sense of Place.

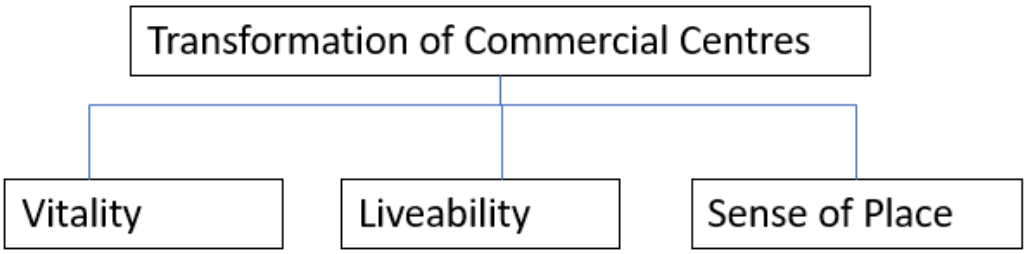


Figure 2-2: Parameters for Urban transformation of Commercial Centres with respect to process of Urban Development

2.6 Research Gap

From the above study it is apparent that CC have undergone drastic transformation in the recent past. Policies of UD have also contributed to transformation of the same. The threads of literature highlight the following gaps which make this thesis relevant.

a. A lot of studies have reflected the CC development in cities in the global scenario. Chinese cities have been analysed to understand course of commercial development

and its effects on a regional scale with respect to their UD process (Ma, 2018, Ke, 2016, Heffernan, 2014,Guy,1998). Markets and CC in the old cities have also been explored especially in Central Asia (Pakora, 2022, Yilmaz, 2020, Gur, 2019, Ghazi 2019, Mehanna, 2019, Isiklar, 2017, Ertekin, 2008). Majority of the literature is based on the Western context (Gomes, 2022, Nanda, 2021, Yang, 2019, Latham, 2019, Congiu, 2019, Rees, 2017, Siksna, 2015, Mc Neill, 2011, Nissen 2008, Gehl, Jacobs,1961). Studies have focussed on aspects related to types and kinds of public spaces, commercial streets, shopping behaviour, building typology etc. Similar changes have occurred in Indian cities. The changing image of CC have also affected local shopping in the peri-urban areas. The need for such studies in the Indian context needs to be done to understand the course of commercial development in the country.

b. CC have been growing in number and size over the last decade. Shopping Malls have developed in all major cities in India. Some have succeeded while others have failed. But through time shopping malls have become the typology which have been replicated. Marketplaces on the other hand have survived through this change. This has gradually influenced typology of local shopping. This has been substantiated by policies to increase commercial development. Commercial Development constructions, 100% FDI under automatic route is permitted in completed projects for operation and management of townships, malls/ shopping complexes and business centres according to the FDI policy of 2020. In case of Retail, 100% FDI and 49% under automatic route are allowed. Commercial Real Estates are now targeting Tier-II and Tier-III cities along with Tier I cities because of 'rapidly urbanization and shifting of business to these cities to save on operational costs' (Taneja, N., 2022, Agarwal, 2022). Evolution of shopping styles have made customers move towards peri-urban areas in the vicinity of city centres. There has been triple-digit growth in 2022 in the office and retail segments vis a vis last year. This has resulted in rapid increase of CC resulting in scattered development. The typologies of CC clash creating breaks in the public realm. Literature has not explored this from an urban design point of view especially for cities in India.

c. The parameters of Vitality, Liveability and Sense of Place have been explored with respect to CC separately on many occasions. To understand the direction of transformation it is imperative to study the same with respect to each other with each other. The complexity of urban fabric in Indian cities calls for identification of

minimum standards or guidelines to help guide development of successful and cohesive public places. CC form one of the most important urban places which reinforce the publicness and ensure better quality of life.

d. Various concepts of shopping have also come with digital transformation like online shopping, hybrid shopping, omni-commerce and experiential shopping. This has affected the formal shopping and CC in general. At this point there is less literature focusing on upliftment of the existing CC to match with the changing context. CC have now transformed to becoming public places which makes it more relevant to understand the various parameters which can help to aid the transformation for any type of CC.

2.7 Research Questions

Based on the above Literature Study and Research Gap, the Research Questions that are generated are as follows:

RQ 1. What are the transformations occurring in Commercial Centres with respect to established parameters Vitality, Liveability and Sense of Place?

RQ 2. What are the related sub-parameters Vitality, Liveability and Sense of Place influence transformation of Commercial Centres with respect to changes in the process of Urban Development?

RQ 3. What are the most important factors influencing Vitality, Liveability and Sense of Place of Commercial Centres in cities like Kolkata?

RQ 4. What are the types of Commercial Centres which are suitable for cities like Kolkata?

3.0 IDENTIFICATION OF ESTABLISHED PARAMETERS AND SUB-PARAMETERS

3.1 Background

It has been established that pattern of transformation of CC need to be studied in context of the urban development process to determine the form of marketplaces in countries like India. To understand this physical process, a study has been made, based on literature in the forms of books, research papers, thesis and internet sources. It has already been established in the previous chapter that the three main parameters of transformation of CC with respect to process of UD are Vitality, Liveability and Sense of Place. These parameters have been explored in detail with respect to CC. Each of these parameters have been divided into sub-parameters which can be measured on the basis of quantitative and qualitative variables.. The Research Design for the same is as follows:

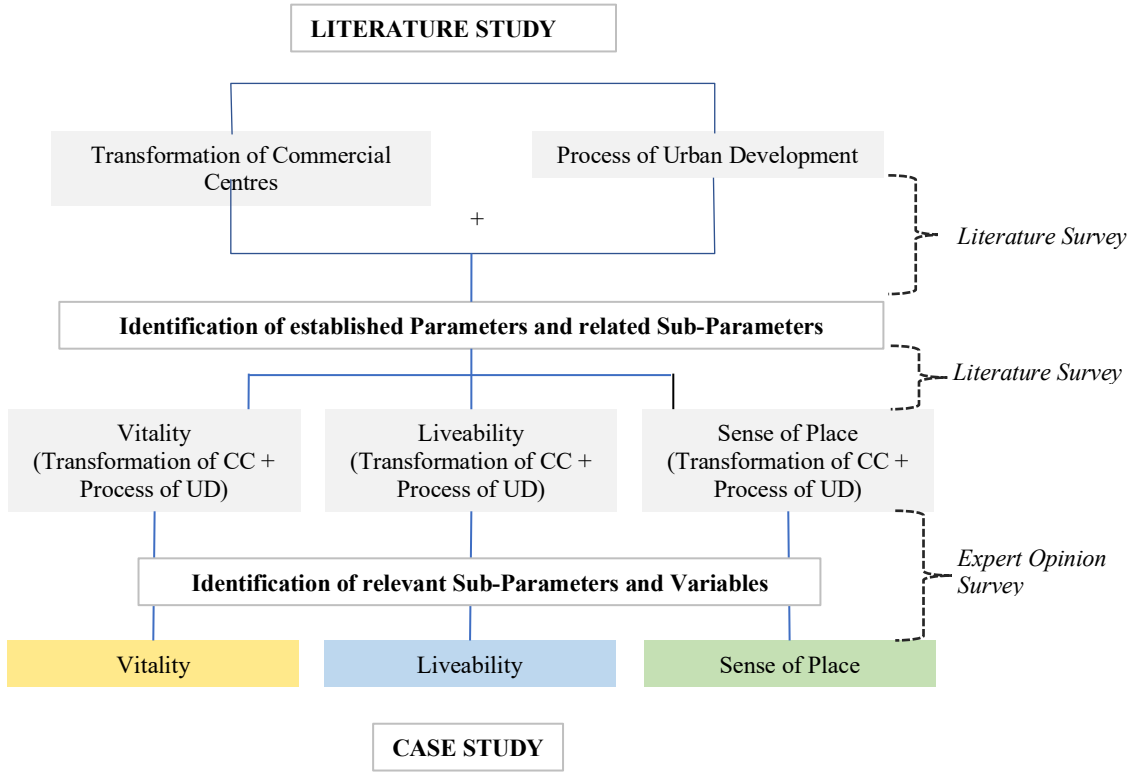


Figure 3-1 : Research Design 1 (Source : Author)

3.2 Identification of established Parameters, Sub-Parameters and Variables

This section looks at the relevant literature based on each parameter and looks towards compiling a list of the relevant parameters, sub-parameters and variables to further evaluate Commercial Centres.

3.2.1 Vitality

Vitality is the measure of publicness of a place. Lynch defines Vitality as 'the degree to which an individual can acquire nutrition, safety and ergonomic needs from environment for survival'. Three dimensions of vitality which influence each other are built environment, human activities and human environment interactions (Yue, 2019). Four generators of urban vitality according to Jacobs are: mixed uses, small blocks, aged buildings and the concentration of activities (Gómez-Varo, 2022).

According to literature, one of the key factors affecting vitality is **activity** (Vitruvius, Alberti, Moughtin (2003), Parker, Ntounis, Quin, Millington). The physical component of Vitality is presence of **Activities and Public Spaces** (Heffernan, Heffernan, Pan, 2014). Public places are vibrant due to presence of a variety of activities. It has been seen that more the activities better the accumulation of people. 'Vitality of cities refers to the ability of attracting lively businesses and human activities, which depends on spatio-temporal gathering **of human flows'** (Zhang, 2020). Attributes of built environment influencing urban vitality are '**neighbourhood attributes, urban form and function, landscape, location, and street configuration'** (Li, 2022). According to Montgomery (1995), 'the notion of urban vitality is only about opening the possibilities for transactions to take place.' This is one of indicators of successful market centres. **Pedestrian flow** quantitatively measures liveliness of marketplaces (Montgomery, 1995). Higher the flow, greater the vitality (Montgomery, 1995).The more these activities are located on walking paths and visible distances, the more the degree of publicness. Active **Frontages along the road edges** of Commercial Centres help in creating an active edge (Liu & Zhang, 2020, Warnaby & Yip, 2005, Ravenscroft, N. 2000). Studies by Jan Gehl (1971) have also shown that presence of these activities on the ground floor enhances chances of success.

Shopping has become more of a product-based activity than a necessity driven activity. **Availability of varied products and services** and customer satisfaction is a driver to determine product mixes in newer destinations like shopping malls Zeng, C., 2018, Dong Li &

Liu, 2017, Heffernan, Heffernan, Pan, 2014, Mohammad Khalaf Ahmad 2012, Khastou & Rezvani, 2010, Jacobs 1961). Attraction factors influencing shopper's satisfaction include loyalty, and word of mouth in shopping mall centres (Mohammad Khalaf Ahmad, 2012). E-commerce has developed drastically in the post COVID-19 era. This has directly influenced convenience shopping chains to venture into e-commerce along with their physical shopping destinations. Facilities like home deliveries and store pickups have been initiated keeping in mind the customer satisfaction factor.

High vitality areas are found in the subcentres that are featured with **mixed land use, good accessibility, and liveability** (Zeng, C., 2018). According to Jacobs (1961) there should be sufficient density of people in an area and have more than 2 major activities to ensure vitality. Diversity in activity ensures Vitality (Khastou & Rezvani, 2010). The presence of **pedestrian activities increases the vitality** by increasing the intensity of activity. Thus, both **formal and informal activities** contribute to increasing the level of publicness of Commercial Centres. (Zukin, 2010, Zeng, 2018, Carmona, M., 2019). Presence of public institutions, commercial institutions, recreational activities, religious activities and transit ensure publicness and good city form (Latham, A., & Layton, J. 2019). Spatial, temporal, or managerial 'in-betweenness' (Aelbrecht, P. 2022) of interstitial spaces increase vitality of urban spaces which is enhanced in case of marketplaces.

The economic benefits of success of public places result in **increased land property and rental values** (Heffernan, Heffernan, Pan, 2014, Ke, Q., & Wang, 2016). The social upliftment is seen through increased human interaction in public places. Along with these environmental benefits such as support for biodiversity, cultural benefits, image and health benefits such as stress reduction and improved personal health has also been observed through literature.

Other physical parameters which govern the **Vitality are Activity, Access, conviviality and comfort, distinctiveness, safety, robustness and flexibility** (Heffernan, Heffernan, Pan, 2014, Maununaho, 2021, Chow, T. T., & Lam, J. C. (1992).

The liveliness of a place is determined by the size and **density** of people which in urban design is manifested by neighbourhood and building density (Wirth,1939). 'The density dimension focuses on **compactness and concentration in urban form**, like plot ratio' (Ye,Li,Liu, 2017). Quantitative parameters for measuring density **are F.A.R., Built-up area and Built-up Volume**. 'Typology tends to exert greater influence on urban vitality than density' (Ye,Li,Liu,

2017). Increase in density directly impacts Vitality (Durand et al. ,2011 lu et al., Sung and Lee,2015). Especially in case of vibrant neighbourhoods, social cohesion is achieved through higher densities. According to Jacobs (1969), a dense concentration of people requires both street accessibility and building density. A lot of discussion of density affecting urban vitality has been made in case of residential neighbourhoods showing indicator businesses influencing publicness (Sung, 2015). **Density is considered as a prerequisite** for success of Commercial Centres.

Physical aspects of built environment are first affected by urban transformation ie., key elements such as 'streets, plots, blocks and buildings as well as transformative processes that shape these elements' (Larkham - Jones 1991, Oliver 2016, Dong li and Liu .2017). It has also been found that 'certain **physical aspects of the built environment** afford their use and as a result can facilitate or inhibit social interactions' (Jacobs, 1961; Newman, 1972). **Urban form** is a common factor in context of activities and ceremonies that relate members of the society, a scene in which group life of people is displayed (Karami, 2015). These interactions give rise to a hierarchy of public places in a city. **Presence or absence of such public places** impact interaction and activity levels in turn affecting Vitality of CC (Carmona, M., 2019).

Kevin Lynch stresses on the ecological and biological **characteristics of urban spaces** (Lynch 1984). **Comfort parameters** like physical comfort (Chow, T. T., & Lam, J. C. (1992) and environmental comfort along with safety parameters like active and passive surveillance are key to ensuring long term activity in the public places created by Commercial Centres. 'The importance of having fine urban grain for improved visual connectivity and movement patterns ensures safety' (Tiwari, 2014).

The type of commercial centre has also been responsible for uplifting or degrading Vitality of urban places. 'Malls have been held responsible for the declining vitality and viability of town centres' (Ozuduru et al., 2014; Teller, 2008). Cities in America and Europe have already seen rapid development of malls which have eventually turned into 'dead malls' (Guimarães, 2018). Malls in Asia are recently undergoing this trend. The advent of unprecedented pandemic has also questioned the type of commercial space that works for public spaces keeping in mind that marketplaces of Asia have been extremely successful as vibrant CC.

An overview of all relevant Sub-Parameters for Vitality of Transformation of CC with respect to process of UD has been compiled below.

Sub-Parameters for Vitality of Transformation of CC with respect to process of UD				
	Sub-Parameter	**Broad Requirement**	**Variable**	**Author**
1	Activity	Liveliness Publicness	• Pedestrian flows • Formal Activity and Informal Activity • Type of Commercial Activity • Amount of Commercial Activity • Product Mixes • Active frontages	Jacobs (1961), Gehl (1971),Zeng, C., 2018, Dong Li & Liu (2017), Heffernan, Heffernan, Pan, 2014, Mohammad Khalaf Ahmad 2012, Khastou & Rezvani, 2010, Liu, Zhang, 2020, Ravenscroft, N. (2000), Gehl (2006)
2	Rental value	More active areas have higher rental values. Land prices and property prices increase in. Vacancy rates increase due to low vitality.	• Land Value • Rent per square feet per day gives comparative cost between different commercial centres.	Heffernan, Heffernan, Pan, 2014) Ke, Q., & Wang, W. (2016).
3	Density	Number of people getting facility of the market in the neighbourhood scale on an average.	• Size density and heterogeneity of the people • Increased Building density increases street activity • Smaller distances or shorter blocks improve accessibility • Mixed use buildings increase functionality. • Indicator businesses in denser neighbourhood.	Wirth (1938), Jacobs (1961), Gehl (1971), Dong Li & Liu (2017), Durand et al. ,2011 lu et al., Sung and Lee,2015 Jacobs (1961)
4	Accessibility	Connectivity Permeability Walkability	• Number and type of access roads, • Type of transport available	Jacobs (1961), Dong Li & Liu (2017), Gehl (1971)(Heffernan, Heffernan, Pan, 2014)
5	Public Space types and characteristics	Types and amount of public spaces generated due to active Commercial Centres	• Formal public spaces • Informal public spaces	Albrecht, P. (2022), Latham, A., & Layton, J. 2019, Zukin (2010), Khastou & Rezvani, (2010). Gehl (1971).

6	Urban form	Urban morphology key to transformative process of development. Physical entities of urban form dictate vitality and attractiveness	• Shape • Size • Volume of space allocated	Larkham and Jones (1991), Oliviera (2016), Lefebvre (1968), Rowley (1994), Dong Li & Liu (2017), Carmona, M. (2019).
7	Customer views	Queries and feedback	-	Vinotha & Gurupandi (2020)
8	Safety	Free from crime and fear of crime	• Design for natural surveillance, No. of Active Frontages • Mechanical Surveillance	Heffernan, Heffernan, Pan (2014)
9	Comfort	Physically and mentally Comfortable place for shopping.	• Thermal Comfort • Acoustic Comfort • Visual Comfort	Chow, T. T., & Lam, J. C. (1992). Meng, Q., & Kang, J. (2015) Heffernan, Heffernan, Pan (2014)
10	Conviviality	Liveliness Publicness	–	Heffernan, Heffernan, Pan, 2014.Maununaho, K., Puumala, E., & Luoma-Halkola, H. (2021
11	Robustness	Resilience	• Relationship between retail areas and blocks • Response to external shocks (disasters)	Heffernan, Heffernan, Pan, 2014. Kim, D., Yun, J., Kim, K., & Lee, S. (2021).
12	Flexibility	Flexibility of use Flexibility of design	-	Heffernan, Heffernan, Pan, 2014.

Table 3-1: Table showing relevant parameters, sub-parameters and variables related to Vitality of transformation of CC with respect to process of UD. (Source: Author)

3.2.2 Liveability

Liveability parameter in Urban Transformation as defined by Bosselmann, is the perception of individuals regarding qualities related with physical settings like streets with 'good transportation network, comfortable urban places, walkable public areas and sound ecology- an integration of human activities with the forces of nature.' This parameter has some **overlap with Sense of Place and sometimes to Vitality** when there is a larger number of participants. For successful public spaces and Commercial Centres, liveability has been defined as an important parameter (Appleyard, 1981; Jacobs, 1996; Wan Ismail, 2010; Rahman, 2014). The parameters of Liveability have been studied extensively for cities in with focus especially on neighbourhoods. Impact of spatial economic development which is key for any commercial institution (Hansen, 1959; Rietveld and Bruinsma, 1998; Vickerman et al, 1999). Commercial centres are a related with creation of active public places generating a comfortable urban environment.In city-centre regeneration, liveability means the 'ability of a centre to maintain and improve its viability (the capacity to attract continuous investment) and vitality (to remain alive)' (Balsa, 2004). The following study of parameters has been made with specific focus on Commercial Centres.

One of the primary factors that influence Livability of Commercial Centres is **location** (Ghazi, N. M., & Abaas, Z. R., 2019). Over the years various studies have been made based on the ideal location of Commercial Centres for Urban development. This has been made on the planning scale by Harold Hotellings (1929), Walter Christaller (1933) and August Lösch (1954). This was known as the Central place theory which looked only at 'concept of single purpose (product) shopping trips to the nearest centre that supplies the merchandise'(Christaller, 1933). This has been thoroughly criticised as it does not consider the multiproduct consumer interaction tendencies which is relevant in today's world. Other theories such as Spatial Interaction Theory, Land Value Theory etc. consider not only the location but also its related or dependant parameters. According to Balsa, the five pillars of Good City Form given by Lynch viz. **vitality, sense, fit, access and control** are the key to making city centres liveable. The **distance from Central Business District and city level connectivity determine the success of Commercial centres** (Suarez, Vega,2017; Zhang et.al. 2018).

Alfonzo (2005) puts forward various parameters which contribute to the Sociological aspect of Liveability like '**feasibility, accessibility, safety, comfort and pleasure-ability'**. Parameters like **Accessibility** and attractiveness of Commercial Centres become strong determinants. One of the key factors in determining the liveliness of a place is the **ease of accessibility** (Sprereigen,1965). The **distance between products and the customer** plays an important role in the crowding of marketplaces. Land attractiveness for business purposes is highly influenced by accessibility (Rakhmatulloh, 2018). Thus, **walkability** of a place becomes an important factor in ensuring ease of access. Shopping in marketplaces is a part of the daily activity of users in the Indian context which makes **availability of shopping within a walkable distance** extremely important. In terms of **accessibility of shopping malls, factors of visibility, access, signage and information** have been analysed in a study. (Poldma et. al, 2014). Alternatively, if the commercial centres provide a variety of services in higher quality it increases the attractiveness of the Commercial Centre, thus increasing the density of the people. In case of Accessibility, for any Commercial Centre to be easily accessible it needs to have **proper connectivity both at the city level and neighbourhood level** (Balsas, C.J.L. ,2004, Shamsuddin, 2012). The ease of access is determined by **distance, time taken to reach** and options for **different modes of transport for Commercial centres** from neighbourhoods (Jacobs, 1961, Dong Li & Liu, 2017, Gehl, 1971, Heffernan, Heffernan, Pan, 2014, Lynch, 1960).

'A successful public space is easy to get to and get through; it is **visible both from a distance** and from up close' (Karami,S., 2015).The characteristic of liveable streets involves familiarity between people ' because they spend time out-of-doors thus creating a sense of community and belonging' (Bosselmann, 1999). It has also been found by Bosselmann that High Density of traffic has negative effects on the liveability of streets. It is associated with 'less social interaction and street activity' (Bosselmann,1999) and 'withdrawal from the physical environment' (Appleyard & Lintell, 1972).

Another parameter that influences the liveability of Commercial Centres is **Safety**. If a public space does not invoke a feeling of safety through its physical elements, it does not attract people. Wheeler (2001) emphasises on the fact that public spaces are liveable if people feel safe and accepted to carry out their activities. **Natural surveillance** is widely regarded in Urban Design theory as eyes in the street (Jacobs,1961). Balsas (2004) focussed on a safe and clean environment for liveable city centres. According to Mehta (2008) and Alfonzo (2005)

'different elements including **reduced setbacks, night lightings, front porches, natural surveillance and active land-use'** are elements of Urban Design which contribute to the feeling of Safety. Measurable elements for Safety in public places have been given by Tiwari (2014) in the form of **Mechanical Surveillance by Artificial Lighting and Surveillance cameras and Passive or Natural Surveillance through the presence of Active frontages, Façade opening ratios, Activity.** Through various studies it has been found that 'fine grain urban form, presence of pedestrian priority areas, integration and upliftment of Lower economic areas, presence of informal vendors, increasing passive surveillance and territoriality' corresponds to increase in the safety of public places in and around Commercial Centres (Tiwari, 2014). In some studies, Safety is one of the highest rated parameters for ensuring liveability of Commercial Centres (Leby,Hashim, 2010).

Health, cleanliness and orderliness of city centres is also an important aspect especially for consumers in cities of the Global South (Leby,Hashim, 2010). Shopping Malls are forward in this aspect as compared to traditional markets. In recent past, the advent of the pandemic has stressed more on this aspect making them to be the first to undergo lockdowns to ensure public health and stop the spread of the disease.

An overview of all possible parameters related to Liveability and Commercial Centres has been given below.

Sub-Parameters for Liveability of Transformation of CC with respect to process of UD				
	Sub-Parameter	**Broad requirement**	**Variable**	**Author**
1.	Location	Position of Commercial Centres.	• Size of CC • Distance of CC from CBD • Access routes at city level. • Layout of CC	Ghazi, N. M., & Abaas, Z. R. (2019, Hotellings (1929), Christaller (1933), Lösch (1954)
2.	Accessibility	Ease of Access Walkability	• Access routes at site level. • Modes of transportation frequently used. • Distance of CC from neighbourhoods	Willigers, J., Floor, H., & van Wee, B. (2007), Hotellings (1929), Christaller (1933), Lösch (1954), Bosselmann (1999), Appleyard & Lintell (1972), Jacobs (1961), Dong Li & Liu (2017), Gehl (1971)(

				Heffernan, Heffernan, Pan, 2014) Lynch (1960)
3.	Attractiveness	Physical Form Urban form	• Size of the marketplace • Layout of the marketplace. • Significant Architectural features	Bosselmann (1999), Appleyard & Lintell (1972), Lynch, Alfonzo (2005)
4.	Land Value	Price of land determines type of commercial activity.		Alonso, Gazi N, Abbas Z, 2019, Paul, 2020
5.	Safety	More safety ensures more crowds.	• Natural Surveillance- Active frontages • Mechanical Surveillance	Mehta (2008), Alfonzo (2005), Tiwari (2014), Leby, Hashim (2010).
6.	Maintenance and Cleanliness	Hygienic conditions	• Cleanliness schedules • Staff	Balsas (2004), Mehta (2008), Alfonzo (2005)
8.	Health	Urban health in public places		Leby,J. ;Hashim,A.; 2010
9.	Control	Increased control restricts public activity.	• Number of entries and exits • Security checks • Restrictions to crowding • Boundary conditions	Lynch 1960, Qu & Hasselaar 2021, Ali, 2023
10.	User Behaviour	Determining product mix	• Types of shops • Footfall	Appleyard & Lintell, 1972, Leby, Hashim (2010).
11.	Sense of Place	Identity of public places	• Familiar places • Familiar landmarks • Familiar people	Leby, Hashim (2010).
12.	Vitality	Publicness of Commercial centres		Lynch (1987), Jacobs (1961), Zeng, C., 2018, Dong Li & Liu (2017), Heffernan, Heffernan, Pan, 2014

Table 3-2: Table showing relevant parameters, sub-parameters and variables related to Liveability of transformation of CC with respect to process of UD. (Source: Author)

3.2.3 Sense Of Place

The term **Sense of place** has many names like **sense of belonging, place attachment**, memory map etc. It can be defined as 'the psychological and emotional dimensions of living in a neighbourhood, on a street, in a building' (Alexander, C, 2006). It is defined as an overall impression surrounding the general ways in which people feel toward places, sense them, and assign concepts and values to them (Musaab, Shuhana and Nahith, 2018). It is also defined as the 'bond that exists between a person and a particular setting' (Hiss,T, 1999). In case of Urban Design, Sense of place plays an important role in the conversion of spaces to places. According to Bosselmann, designers firstly associate **Sense of Place** with **spatial definition and characteristics.**

Urban form and appearance are the characteristics of the physical environment, especially buildings, which are distinctive and easily recalled (Shinbira & Sulaiman, 2010). Quality of urban space contributes to the Sense of place which in turn affects the Vitality of the public space. **Shape, size, height, color, materials, texture, details, location, and movement** are some of the characteristics of urban form that determine sense of place (Musaab, Shuhana and Nahith, 2018). For Commercial Centres and marketplaces, it has been seen that a sense of belonging to the urban place increases its publicness. The physical parameters defining Urban form of a place like **Street Width, Building Height, and Building Front Offset** are considered as quantitative factors (Kameli, 2016, Montgomery,1998, Mooza et.al, 2015, Berg et. al., 2020.). Perception of Urban form happens through **Edge and Shape of Urban Form** especially in case of Commercial centres and streets (Montgomery,1998, Mooza et.al, 2015, Berg et. al., 2020,Thwaites, K., Simpson, J., & Simkins, I.,2020).

Quality of space is enhanced through the experience of a place. Parameters like **'diversity, vitality, accessibility, safety, and distinctiveness,** contribute to the experience of a sense of place' (Berg et. al., 2020). Six tangible parameters which influence the image of shopping areas that help in attracting customers especially in shopping malls are **'location/access, parking, ambience, retail offer, leisure offer, and facilities'** (Gomes and Paula, 2017). In Dhaka these were considered important parameters for marketplaces. **'Visibility of these spaces** has an impact on the social activities of these spaces'. (Gomes et.al. 2018). Studies have shown that sense of place in commercial complexes contribute to 'the capability of judging about an abstract issue like the meaning of **sense of direction** which refers to the ability of a person to find his way' (Kameli, 2016).

Commercial Centres have been found to create the liveliness of the city. **Safety and security** of such areas is most important. This can be ensured by promoting **proper visibility of such centres.** It has been seen that relocation causes people to feel upset to go away from the original location (Mooza et.al, 2015). Other studies have revealed that increasing the sense of place of an area increases the **safety factor** of the area which has been accessed by presence of **natural and mechanical surveillance** (Berg et. al., 2020). Visibility is also measured quantitatively by **Distance, Height and Angle of Visibility**. **Vista, Skyline** (Sprereigen, Harrison and Howard, 1972, Shamsuddin, 1997) and **Presence of Obstructions** add to the qualitative aspect of visibility (Caprotti, F.,2019, Congiu, T. et. al., 2019).

Imageability is one of the major factors which influence the Sense of Place physically. The parameters of Kevin Lynch have been further studied by Morello, Eugenio and Ratti (2010) in an attempt to quantify it to understand the Sense of Place. As a result, all the imageability parameters viz. **District, Edges, Nodes, Pathways and Landmarks** become operative parameters. Edge parameter along with 'Activities and users, Urban Floorscape and Urban Furniture' were used to understand the physical factors for comfortable public spaces in Doha (Mooza et.al, 2015). **Nodes and landmarks** are taken to be identifying features for public spaces(Shamsuddin and Ujang, 2008). This also enhances **the visibility of public spaces**.

Legibility is defined as “the ease with which its parts can be recognized and can be organized into a coherent pattern” (Lynch, 1960). ‘The 'familiarity' of streets and street life will be celebrated’ (Montgomery,1998). Montgomery further suggests that to make a public space successful, the feeling of ‘**sense of belonging, historical and cultural continuity; opportunities for gossip; vitality; flamboyance; colour; beauty/aesthetic’** need to be instilled.

With regards to shopping areas, Sense of Place has been considered a **Personal Characteristic** which influences increase or decrease of shopping behaviour (Berg et.al, 2021). 'People, in their capacity as economic actors are always making explicit comparisons of places' (NAP, 2002). Along with these further studies have proved that **emotional and social attachment** conditions add value to the meaning of sense of place. This makes the parameter difficult to quantify.

An overview of all possible parameters related to Sense of Place and Commercial Centres based on literature has been given below.

Sub-Parameters for Sense of Place of Transformation of CC with respect to process of UD				
Sl No.	**Sub-Parameter**	**Broad requirement**	**Variable**	**Author**
1.	Location	Position of the Commercial Centres	• Distance from the neighbourhoods	Hiss (1999), Gomes and Paula, (2017)
2.	Accessibility	Ease of Access	• Types of roads • Activities on roads	Gomes and Paula, (2017), Kameli,M., (2016), Berg et. al., 2020
3.	Diversity	Multiple activities and engagements		Berg et. al., 2020, Nia & Suleiman, 2017, Nia, 2021, Istrate, Chen, 2022
4.	Vitality	Publicness of urban space		Berg et. al., 2020, Lillevold, K., & Haarstad, H.,2021
5.	Safety	Safe conditions for all visitors		Berg et. al., 2020, Kameli, 2016
6.	Urban Form	Easy to identify and locate	• Edge • Shape of Urban area • Street Width • Height of buildings. • Building front Offset	Kameli,M., (2016) Montgomery,1998), Mooza et.al, 2015), Berg et. al., 2020.
7.	Parking	Sufficient parking numbers for different vehicles	• Number of parking spaces • On street Parking • Entry and exits for parking	Gomes and Paula, (2017), Kameli,M., (2016), Berg et. al., 2020
8.	Ambience	Comfort and safety conditions	• Positive Ambience • Negative Ambience	Gomes and Paula, (2017), Kameli,M., (2016), Berg et. al., 2020
9.	Visibility	Visual accessibility	• Distance of Visibility • Width of Road • Height of Visibility • Presence of Visual Obstruction (trees, placards, façades under obstruction) • Vista and Skyline	Gomes (2018), Berg et.al, 2021, Mooza et.al, 2015
10.	Quality of open spaces	Vibrancy and activity patterns in open spaces		Morello, Eugenio and Ratti (200), Mooza et.al, 2015
11.	Imageability	Identity of public places	• District • Edge • Node • Pathways • Landmark	Lynch (1960), Morello, Eugenio and Ratti (2010), Gomes (2018), (Mooza et.al, 2015).
12.	Legibility	Urban Pattern Cohesiveness	• Colour • Spaces for fun • Aesthetic	Lynch (1960), (Montgomery, J.,1998)
13.	Emotional parameters	Sense of Belonging Personal Characteristic		Berg et.al, 2021, Mooza et.al, 2015).

Table 3-3: Table showing relevant parameters, sub-parameters and variables related to Sense of Place of transformation of CC with respect to process of UD. (Source: Author)

3.3 Inter-relationship between Parameters, Sub-Parameters and Variables

The methodology for the current paper has been to study all relevant parameters from literature and derive parameters related to transformation of Commercial Centres and process of Urban development. This list will be used to evaluate Commercial centres in the city of Kolkata in order to understand the key parameters influencing development of Commercial Centres in the city. To derive relevant parameters, firstly the common and repetitive parameters from literature study have been shortlisted as seen in the previous section. Secondly an evaluation is made based on the expert opinion surveys, to understand the focus parameters that need to be evaluated for studying transformation of Commercial Centres.

3.3.1 Methods Used

From literature study it has been seen that evaluation of the 3 parameters of vitality, liveability and sense of place and the most important parameters for urban transformation. A list of questions based on the 3 parameters were distributed among 16 experts from the fields of urban design, architecture and real estate to evaluate the most important parameters which influence transformation of commercial centre with respect to Urban Development. 5-point Likert scale has been used to evaluate the responses and find out the agreement percentage for each of the parameters. The sub-parameters with a minimum of 75% have been considered for further the study regarding to the transformation of shopping centres. The results for each of the parameters has been demonstrated below.

3.3.2 Vitality

A list of 13 questions (Appendix 1) were distributed among 16 experts evaluate the most important sub-parameters which influence the Vitality. A minimum of 75% agree percentage has been considered as benchmark for the most important parameters. The results from the same have been given the table below.

Sl. no.	Questions	Strongly agree	Agree	Neutral	Disagree	Strongly dsagree	Agree %
1	Is Vitality dependent on Comfort?	43.75	25	18.75	12.5	0	68.75
2	Is Vitality dependent on Accessibility?	6.25	50	37.5	12.5	0	56.25
3	Is Vitality dependent on Public Space?	43.75	43.75	12.5	0	0	87.5
4	Is Vitality dependent on Customer Views?	25	37.5	37.5	0	0	62.5
5	Is Vitality Dependent on type of Activity?	50	43.75	0	4.25	2	93.75
6	Is Vitality dependent on Robustness?	6.25	18.75	37.5	31.25	0	25
7	Is Vitality dependent on Location?	0	6.25	56.25	31.25	0	6.25
8	Is Vitality Dependent on Conviviality?	0	6.25	56.25	31.25	0	6.25
9	Is Vitality Dependent on Density?	25	37.5	37.5	0	0	62.5
10	Is Vitality Dependent on Urban Form?	0	31.25	50	12.5	0	31.25
11	Is Vitality Dependent on Cleanliness?	18.75	18.75	25	37.5	0	37.5
12	Is Vitality Dependent on Rental values?	43.75	25	18.75	12.5	0	68.75
13	Is Vitality Dependent on Safety?	25	37.5	37.5	0	0	62.5

Table 3-4: Table showing 5-point Likert scale evaluation from expert opinion on relevant Vitality parameters for transformation of Commercial Centres and process of Urban Development.

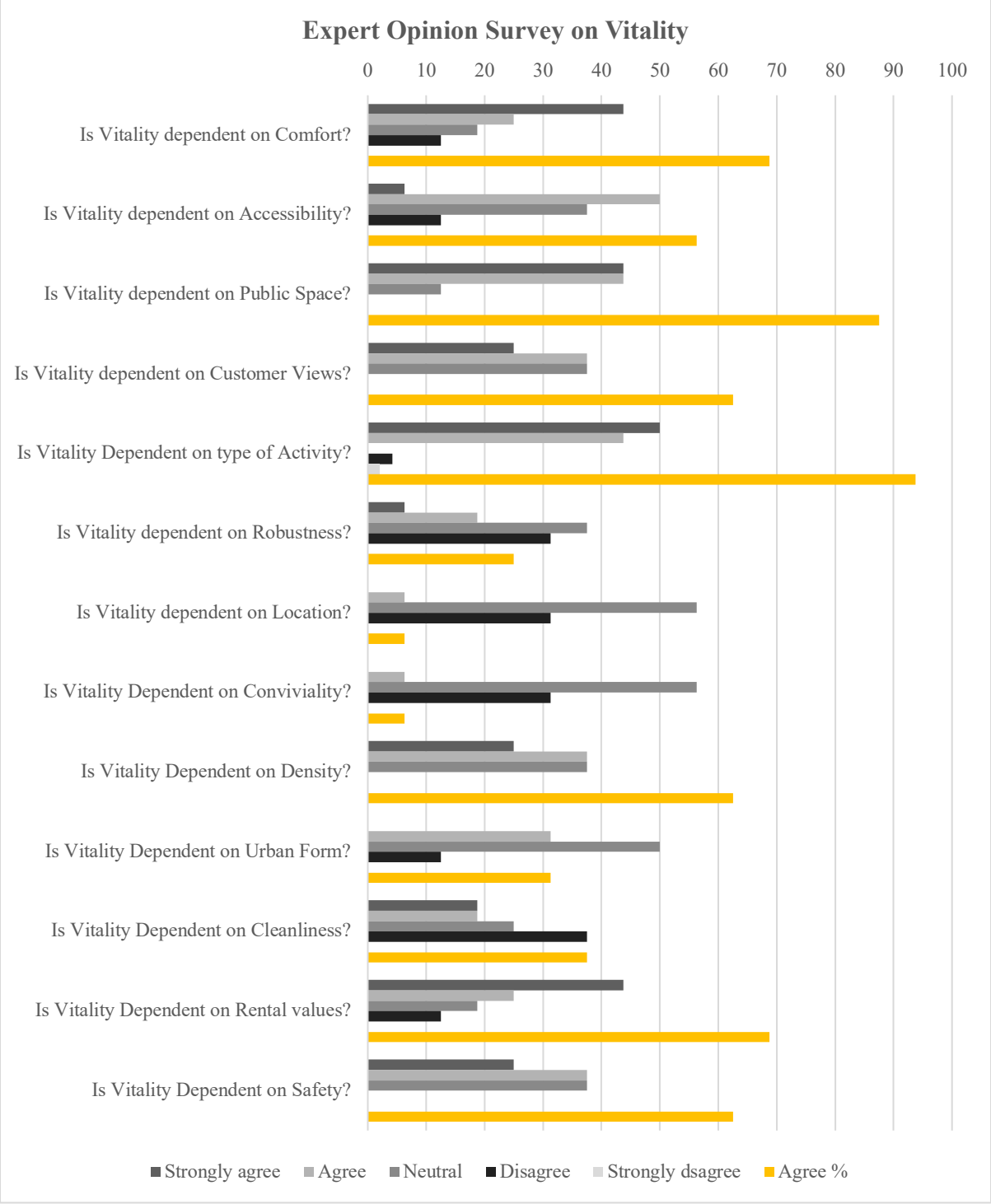


Figure 3-2 : Graphical representation of the showing 5-point Likert scale evaluation from expert opinion on Vitality. (Source: Author)

The two sub-parameters of Activity and Public Space. For evaluation of the sub-parameters the corresponding indicators from literature study relevant for transformation of Commercial Centres. Some of the widely used variables as derived from literature review are given below with respect to each Sub-Parameter.

a. Activity:

Two dimensions of measurement of Activity is by understanding the type of activity and amount of people engaged in it. Literature points out that **amount and nature of Commercial Activity** and **Product mix** as the determinants for successful Commercial Centres (Zeng, C., 2018, Dong Li & Liu, 2017, Heffernan, Heffernan, Pan, 2014, Mohammad Khalaf Ahmad 2012, Khastou & Rezvani, 2010, Jacobs 1961). **Amount of Building Use** dedicated to **Commercial Activity** in the study area determines the influence of CC. **Pedestrian Flow** is considered as the most common determinant for publicness generated due to Activity (Liu & Zhang, 2020, Warnaby & Yip, 2005, Ravenscroft, N. 2000).

b. *Public Space:*

In case of public space, **formality and informality of public spaces** determine the amount of publicness in urban spaces which in turn influence Vitality (Zukin, 2010, Zeng, 2018, Carmona, M., 2019).

The final list of parameter and corresponding sub-parameters and variables are given below.

Parameter	Sub Parameter	Variable		Unit Measure	Survey type
Vitality	Activity	*Amount of Building Use (Commercial) (Qn)*		*% usage of total urban area considered*	Mapping
		Pedestrian Flow (Qn)		*Average people / minute*	Visual
		Nature of Commercial activity (Ql)	*Formal/ Informal*	*% usage of total urban area considered*	Visual
		Product mix (Ql)	*Types of uses*	*Numbers*	Visual
	Public Space	*Formal Public Space (Qn)*		*Sq.m.*	Mapping
		Informal Public Space (Qn)		*Sq.m.*	Mapping
		Type of Formal Public Space (Ql)			Visual
		Type of Informal Public Space (Ql)			Visual

Table 3-5: Final list of parameters to evaluate Vitality of Commercial Centres

3.3.3 Liveability

Based on literature study, there are 11 parameters influencing Liveability due to transformation of Commercial Centres. From the supportive literature, Location, Accessibility, Attractiveness, Land value, Safety, Maintenance and Cleanliness, Sense of Place, Health, Control and User behaviour. A list of 13 questions (Appendix 2) were distributed among 16 experts evaluate the most important sub-parameters which influence the Liveability. A minimum of 75% agree percentage has been considered as benchmark for the most important parameters. The results from the same have been given the table below.

Sl .no.	Questions	Strongly agree	Agree	Neutral	Disagree	Strongly dsagree	Agree %
1	Is Liveability dependent on Activity?	6.25	12.5	75	6.25	0	18.75
2	Is Liveability dependent on Accessibility?	31.25	50	12.5	6.25	0	81.25
3	Is Liveability dependent on Safety?	56.25	25	18.75	0	0	81.25
4	Is Liveability dependent on Attractiveness?	12.5	37.5	25	25	0	50
5	Is Liveability Dependent on Formal Public Space?	0	0	37.5	56.25	0	0
6	Is Liveability Dependent on Informal Public Space?	0	31.25	50	12.5	0	31.25
7	Is Liveability dependent on Density?	0	6.25	25	50	18.75	6.25
8	Is Liveability dependent on Location?	37.5	46.75	15.75	0	0	84.25
9	Is Liveability Dependent on Imageability?	0	0	12.5	68.75	18.75	0
10	Is Liveability Dependent on Visibility?	0	6.25	31.25	37.5	25	6.25
11	Is Liveability Dependent on Urban Form?	18.75	12.5	18.75	37.5	12.5	31.25
12	Is Liveability Dependent on Cleanliness?	0	0	43.75	31.25	25	0
13	Is Liveability Dependent on Size of Commercial Centre?	0	0	37.5	50	6.25	0

Table 3-6: Table showing 5-point Likert scale evaluation from expert opinion on relevant Liveability parameters for transformation of Commercial Centres and process of Urban Development.

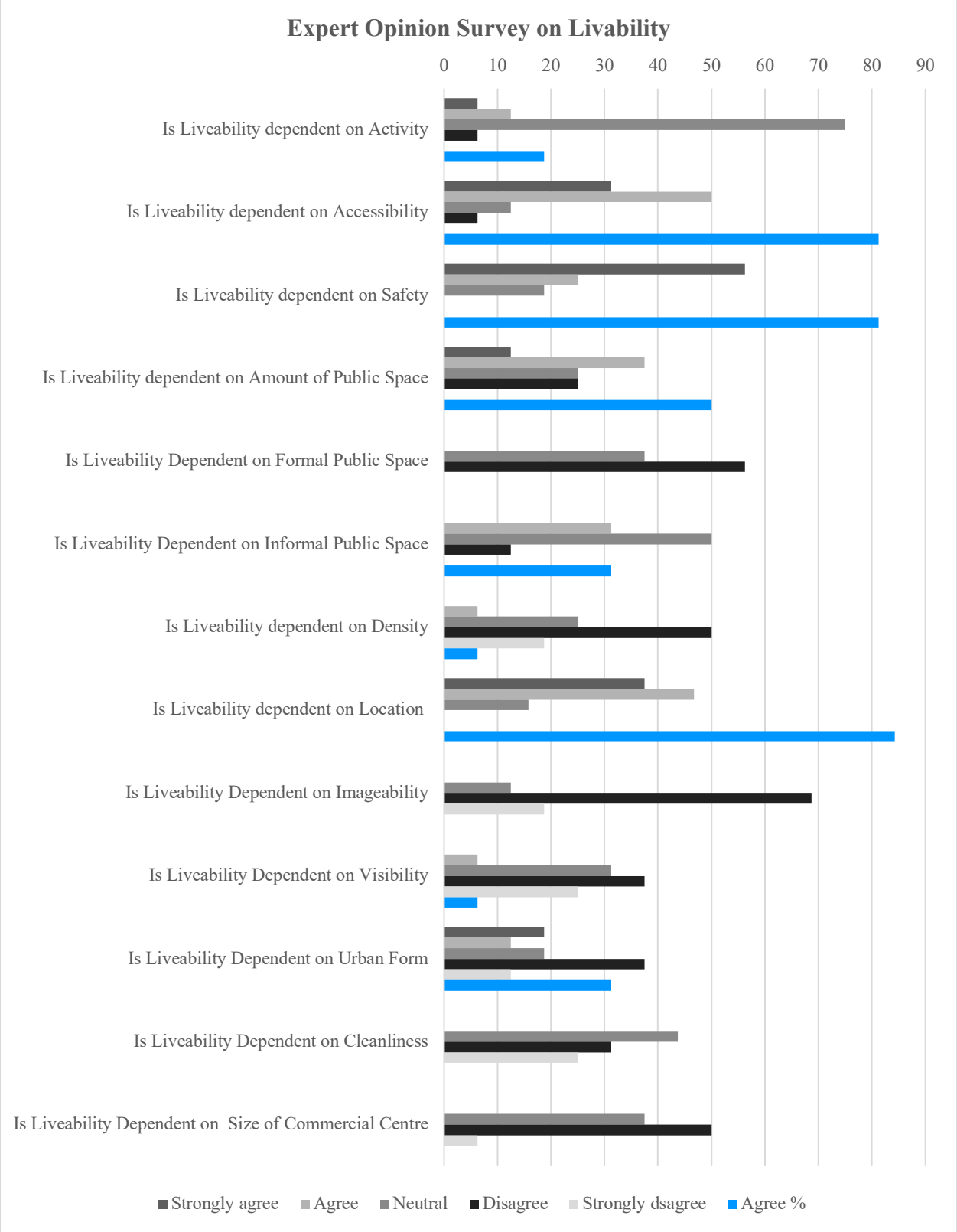


Figure 3-3 : Graphical representation of the showing 5-point Likert scale evaluation from expert opinion on Liveability. (Source: Author)

The sub-parameters with more than 75% agreement are Location, Accessibility and Safety. These will be useful to appraise any existing Commercial Centre to evaluate the minimum Liveability aspect of the same. Some of the widely used variables as derived from literature review are given below with respect to each Sub-Parameter.

a. ***Location:***

The variables of **Size of Commercial Centres** and **distance from the CBD** determine the importance of Location of Commercial Centre (Ghazi, N. M., & Abaas, Z. R. (2019, Hotellings 1929, Christaller, 1933, Lösch, 1954). The **ease of accessibility** to the same determines the overall quality of location **at the city level**. (Hotellings, 1929, Christaller, 1933, Lösch, 1954, Bosselmann 1999, Jacobs, 1961, Dong Li & Liu, 2017, Heffernan, Heffernan, Pan, 2014), Lynch 1960).

b. ***Accessibility:***

Accessibility is one of the primary requirements to ensure liveability and publicness of urban centres. It can be measured by **distance and time taken to access from the neighbourhoods** quantitatively (Willigers, J., Floor, H., & van Wee, B., 2007) and qualitatively by appraising the **types of pathways and modes of transportation** used by the customers (Jacobs, 1961, Dong Li & Liu, 2017, Gehl, 1971, Heffernan, Heffernan, Pan, 2014, Lynch, 1960).

c. ***Safety:***

The most frequently occurring factors influencing Safety in an urban context are **Mechanical Surveillance by Artificial Lighting** (Mehta, 2008, Alfonzo, 2005, Gehl, 2006),presence of Surveillance cameras, **Passive or Natural Surveillance** through the **presence of Active frontages** (Gehl, 2006, Tiwari, 2014), presence of pedestrian priority areas like **pathways** (Tiwari, 2014, Leby, Hashim (2010).

The final list of parameter and corresponding sub-parameters is given below.

Parameter	Sub Parameter	Variable		Unit Measure	Survey Type
Liveability	Location	*Size of Commercial Centre (Qn)*		*Sq.m.*	Mapping
		Distance of Commercial Centre from CBD (Qn)		*K.m.*	Mapping
		Routes - Area Level (Ql)			Visual
		Layout (Ql)			Visual
	Accessibility	*Distance of facilities from neighbourhoods (Qn)*		*metres*	Mapping
		Time taken to access (Qn)		*minutes*	Visual
		Routes - Site level (Ql)			Visual
		Mode of travel (Ql)			Visual
	Safety	*Natural Surveillance (Qn)*	*No. of Active frontages*	*Numbers*	Mapping
		Formal Surveillance (Qn)	*No. of Security Patrol*	*Numbers*	Mapping
			No. of Security cameras	*Numbers*	Mapping
		Types of pathway (Ql) (Open/ Closed)			Visual
		Type of lighting (Ql)			Visual

Table 3-7: Final list of parameters to evaluate Liveability

3.3.4 Sense of Place

Sense of Place is the 3rd primary parameter associated with transformation of Commercial Centres. Based on literature study, there are 13 parameters that influence transformation of Commercial Centres. From the supportive literature Location, Accessibility, Diversity, Vitality, Safety. Urban Form, Visibility, Parking, Ambience, Quality of Open Spaces, Imageability and Product Mix.

A list of 13 questions (Appendix 3) were distributed among 16 experts evaluate the most important sub-parameters which influence the Sense of Place. A minimum of 75% agree percentage has been considered as benchmark for the most important parameters. The results from the same have been given the table below.

Sl. no.	Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Agree %
1	Is SOP dependent on Location?	6.25	12.5	25	43.75	12.5	18.75
2	Is SOP dependent on Accessibility?	12.5	12.5	25	18.75	31.25	25
3	Is SOP dependent on Safety?	18.75	6.25	18.75	37.5	18.75	25
4	Is SOP dependent on Vitality?	6.25	18.75	18.75	37.5	18.75	25
5	Is SOP Dependent on Ambience ?	6.25	18.75	18.75	37.5	18.75	25
6	Is SOP Dependent on Parking?	6.25	18.75	18.75	37.5	18.75	25
7	Is SOP dependent on Quality of Open Spaces?	0	6.25	6.25	12.5	75	6.25
8	Is SOP dependent on Legibility?	0	0	18.75	68.75	12.5	0
9	Is SOP Dependent on Imageability?	25	50	25	0	0	75
10	Is SOP Dependent on Visibility?	43.75	34,25	15.75	6.25	0	78
11	Is SOP Dependent on Urban Form?	27.25	50	20	2.75	0	77.25
12	Is SOP Dependent on Emotional Parameters?	0	43.75	18.75	37.5	0	43.75
13	Is SOP Dependent on Diversity	18.75	18.75	25	37.5	0	37.5

Table 3-8: Table showing 5-point Likert scale evaluation from expert opinion on relevant Sense of Place parameters for transformation of Commercial Centres and process of Urban Development.

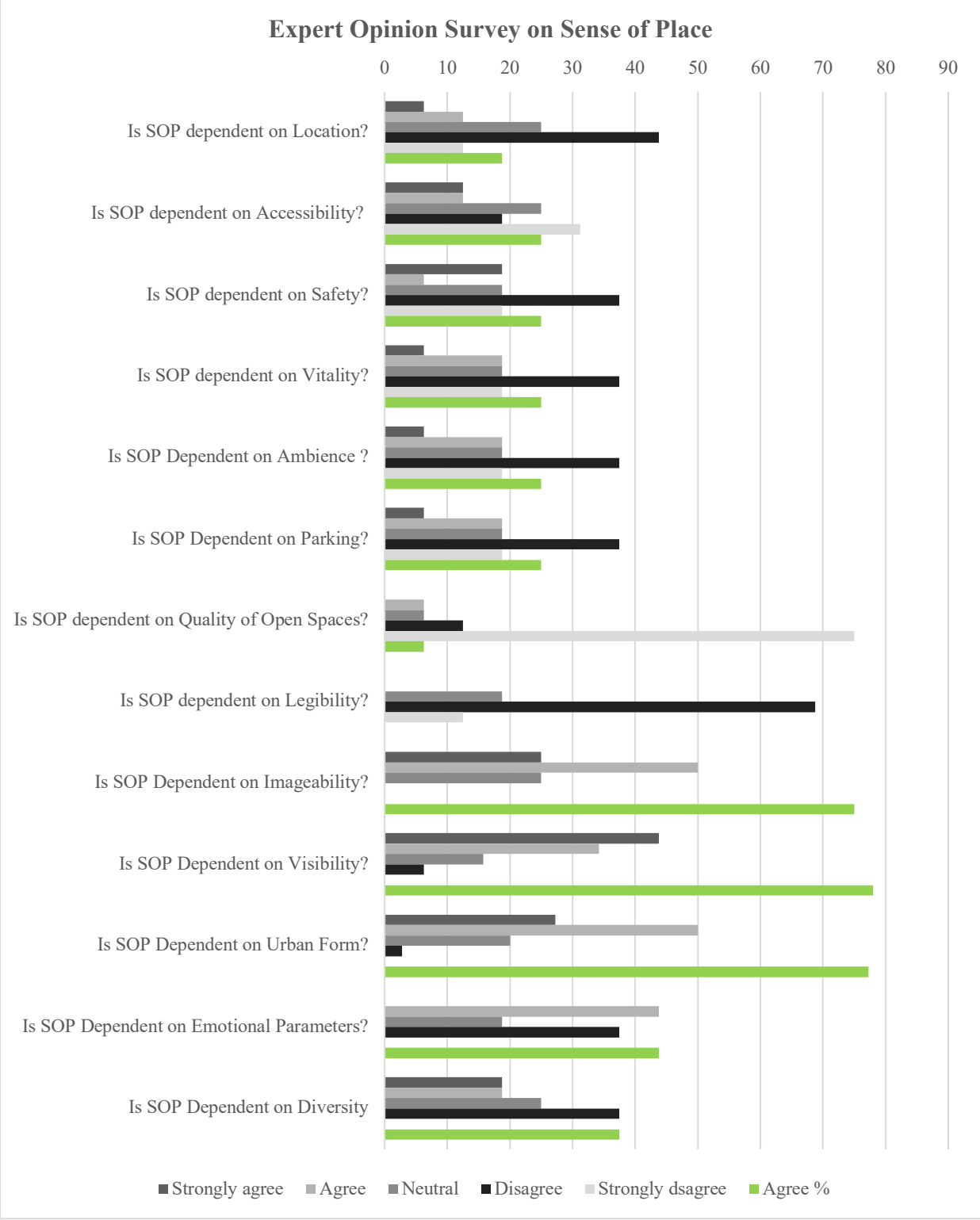


Figure 3-4 : Graphical representation of the showing 5-point Likert scale evaluation from expert opinion on Sense of Place. (Source: Author)

The sub-parameters with more than 75% agreement are **Urban Form, Visibility and Imageability.** These will be useful to appraise any existing Commercial Centre to evaluate the minimum Liveability aspect of the same. Further investigation in Literature (Refer 3.2.3), all three parameters can be evaluated by certain quantitative and qualitative factors.

a. Urban Form

The physical parameters defining Urban form of a place like **Street Width, Building Height, and Building Front Offset** are considered as quantitative factors (Kameli, 2016, Montgomery,1998, Mooza et.al, 2015, Berg et. al., 2020.). Perception of Urban form happens through **Edge and Shape of Urban Form** especially in case of Commercial centres and streets (Montgomery,1998, Mooza et.al, 2015, Berg et. al., 2020,Thwaites, K., Simpson, J., & Simkins, I.,2020).

b. Visibility

Similarly , Visibility is also measured quantitatively by **Distance, Height and Angle of Visibility**. **Vista, Skyline** (Sprereigen, Harrison and Howard, 1972, Shamsuddin, 1997) and **Presence of Obstructions** add to the qualitative aspect of visibility (Caprotti, F.,2019, Congiu, T. et. al., 2019).

c. Imageability

Imageability in Urban Design is the best possible measure of sense of place in physical terms. To evaluate it sub-parameters of **District ,Edges, Nodes, Pathways and Landmarks** determine the extent, feeling and sense of belongingness in physical terms. This has been used over time by various researchers throughout Literature.

The final list of parameter and corresponding sub-parameters is given below.

Parameter	Sub Parameter	Variable		Unit	Survey Type
Sense of Place	Urban Form	*Street Width (Qn)*		*metres*	Visual
		Building Height (Qn)		*metres*	Visual
		Building Front Offset (Qn)		*metres*	Visual
		Edge (Ql)			Visual
		Shape			Visual
	Visibility	*Height of visibility/ (Qn)*		*metres*	Visual
		Angle of Visibility (Qn)		*degrees*	Visual
		Presence of Obstruction (Ql)	*Trees/ Placards/ % facades under obstruction*	*Numbers/ percentage*	Visual
		Vista and Skyline(Ql)			Visual
	Imageability	*No of Defined Edges (Qn)*		*in Numbers*	Visual
		No. of nodes (Qn)		*in Numbers*	Visual
		No. of pathways (Qn)		*in Numbers*	Visual
		No. of Landmarks (Qn)		*in Numbers*	Visual
		District (Ql)			Visual
		Edge (Qi)			Visual
		Landmark (Ql)			Visual
		Type of Node (Ql)			Visual

Table 3-9: Final list of parameters to evaluate Sense of Place

3.4 Inference

The above 3 tables viz **table 3-5, 3-7 and 3-9** form the framework for on-site study of selected CC in the city of Kolkata. The following chapter further explores how the above parameters , sub-parameters and variables are influenced by the CC in the context of the city of Kolkata.

4.0 CASESTUDY

4.1 Background

This chapter focusses on the city of Kolkata, its CC and processes of UD. The history of CC and UD in Kolkata has been studied. Kolkata and its adjoining areas have been considered to identify relevant CC for on-site study. The intent of this chapter is to evaluate the CC and understand the transformation characters of CC in the city.

4.2 Kolkata

Kolkata, or the former British capital called Calcutta, is one of India's largest metropolitan cities and one of its major ports. The city is situated on the east bank of the Hugli (Hooghly) River. Kolkata has always been the dominant urban centre of eastern India. It is currently the capital of the state of West Bengal and still is the commercial capital of eastern India. Calcutta is an Anglicized version of the Bengali name Kalikata. In 2001 the government of West Bengal officially changed the name of the city to Kolkata.

Kolkata was established in 1686, because of Job Charnock's visit to to the city on August 24, 1686. Originally as a member of the East India Company, the British set up a factory in the area. Eventually, the villages of Kalikata, Gobindapur and Sutanuti, were developed into the city, which served as important trading centres in the 16th, 17th and 18th centuries. After the conquest of Bengal by Lord Clive and under the first British Governor-General, Warren Hastings, all administrative activities from Murshidabad, the capital of Bengal in the Mughal era, to Calcutta the newly built commercial capital of the British Raj. In 1911, the capital was shifted from Calcutta to Delhi. From 1890 to 1930, Calcutta became the seat of the Nationalist Movement which led the struggle for independence. In 1947, when India gained independence, the partition of Bengal took place and Calcutta became the capital city of the state of West Bengal.

4.3 Kolkata and Commercial Centres

To understand the importance of commercial centre with respect to Kolkata one need to look closely at commercial activities before the British Raj. The area of Sutanuti, Kalikata and Gobindapur has been a centre of local trade for a long time. A long line of merchant families were the most powerful families who regulated trade in the region. They were the Sheths and Basacks, the merchants of yarn and cloth market at Sutanuti. With the arrival of the British, Janardan Sheth became a trading agent of the British. Shobharam Basack (1690–1773) became a millionaire by supplying textiles to East India Company.

In the 16th century, the Seths moved from Saptagram to Gobindapur and later shifted to Sutanuti Haat which is the present-day Burra Bazar. This move resulted in the formation of the oldest commercial centres in the city. Janardan Sheth and his family set up a flourishing business with their base at Burra bazar. The clothing sector prospered under the Marwaris. The Basaks were another important family which became a leading business family. The most common features of these families were they acquired large stretches of land and built mansions. It is said that Shobharam Basak left thirty-seven houses to his heirs. But the flourishing business of Bengali tradesmen declined over the mid-eighteenth century. At this point the commercial centre of Burra Bazaar was taken over by the businessmen from other places, especially the Marwari tradesmen. The area transformed from a marketplace to a commercial neighbourhood.

The Marwaris ousted the cloth merchants and changed the name of old Sutanuti haat to Barabazar. Even though the Bengali tradesmen declined the city grew. Due to a long history of traders in the city, the market of Burrabazar essentially developed as alleys dedicated to a specific type of commodity. This is a common phenomenon in the markets of that era. The markets were gradually owned and regulated by the wealthy landlords and merchants of the city. As commercial activity increased, more markets started forming around the native part of the city. Some of these markets were already present and the others grew out of the requirement of the population. Markets like Bagbazar, Baithak khana market, Janbazar, Bowbazar , Mechchuabazar etc. were already existing from the pre-British era. The condition of the marketplaces was unhygienic and derogatory. There were no segregated places for loading and unloading of goods and shopping. The timings were not regulated in these markets. Most of these markets were in Native part of the new city commonly known as the Black Town.

As the British settled in India and expanded their trading via Kolkata, they were instrumental in redefining the commercial landscape of the city. Because of the flourishing trade, the British had started to settle in the city. This called for markets which were targeted for the European population. A European market known as New Dhamatala Market was run by a trader named Hiralaal Shil. But like the Native markets, this also was criticized for its physical conditions. This was one of the major reasons why there was a drive for regeneration of many of the native markets. Along with this there were some new proposals for markets around the city. One of the most important markets is New Market in Esplanade which was in the White town of Kolkata. Formerly known as the SS Hogg Market, it was opened in 1874. This was originally a European covered and regulated market. This market changed the shopping trajectory of the city. The Municipal Reports during this time recorded the names and conditions of the markets that were proposed. This shaped and strengthened the commercial structure of the city. The SS Hogg market expanded its product range to suit the European as well as the native population. Initially the market only had businesses of freshly produced goods such as raw vegetables, fish, meat and food products. Stores like Nahoum's and other such food stalls remain iconic till date. But as times progressed the textile traders took over the primary store locations all along New Market. The concept of all products under the same roof was roughly formulated at the New Market. The markets from now on started to be categorized into 2 major categories – a) Wholesale markets and b) Retail markets. The main distributor markets were primarily wholesale markets like Burrabazar and local bazars and commercial centres were retail markets.

Figure 4-1: Image of New Market , Kolkata 1890
(Source: https://www.telegraphindia.com/culture/calcutta-that-was-in-pictures/cid/1108049)

A new set of Municipal Markets were proposed eventually that would be scattered around the city primarily as secondary market chain which served the different regions of the city. Examples of such markets were Maniktala; Gariahat, Lake market, Jadavpur, Ultadanga etc. These markets provided shops, stalls and spaces for traders in the hinterland to provide necessary goods for the city population. These markets were owned by different organisations like Kolkata Municipal Corporation (KMC), Kolkata Improvement Trust (KIT), Kolkata Metropolitan Development Authority (KMDA) and some markets are owned by private organisations. There are 358 listed markets all over the city. Currently KMDA has a list of 41 markets. Due to two city expansions in the form of Saltlake and New Town and addition of different municipalities as a part of the city there are more development regulating markets in the current scenario. Saltlake governs 16 block markets, and the New Town Kolkata Development authority has 10 markets to its names. Along with this, there are 29 more municipalities under the Kolkata Metropolitan Area which have markets in their respective areas. There were the smaller scale local traditional marketplaces which served daily needs of the neighbourhoods. This network of markets has developed over time and get their supplies form various parts of the country. The central supply unit of all these markets is Burra Bazaar. The type of shopping in all these markets are traditional in nature. Raw essential goods are sold in spaces and high slabs. The shops sell the dry essential goods and consumer goods. The shops are arranged in linear fashion in a grid inside the market complex.

Some of the Municipal market extensions have also experimented with multi-storeyed building for consumer goods. The examples of such markets are the New Market extension and Gariahat market. The raw essential goods are intended to be separated from essential primarily with building type. But the original one stored market still retain a lot of consumer goods stores. The new Buildings got occupied by newer traders and were initially not that successful. This was another turning point in the commercial landscape. A lot of markets sprung up across the city known as Supermarkets or Air-Conditioned (A.C.) markets. These were three to four storey market buildings with air-conditioned shops which was a first for the city. These markets are introverted in nature and there are no shops facing the road. These were a variation which led to promotion of shopping mall trend in the country.

In the last two decades have seen another major shift in the commercial landscape of the city. Due to rapid globalization around the country- Along with foreign brands and products, there was a push toward the investment into malls all around the country. The first mall in India was built in Chennai when their original colonial departmental store known as Spencer Plaza was

rebuilt in 1991 on 10 acres of land. In early next decade, shopping malls started to be made across the county. The first mall in Kolkata was Forum Shopping mall built in 2003 with a built-up area of 200,000 square feet of area and has 125,000 square feet of retail area. Quite a few malls were built up during this time. Even though at least 10 malls were built during the next few years, only City Centre, Salt Lake was the most successful amongst them. Initially the other malls were not remarkably successful. But in the next decade, these became a popular destination for the population. The boom of young populist consumerist cultures can be attributed to the change in the shopping culture in not only the city but also the country.

Shopping malls fall under the category of Modern retail outlets. The rise in shopping malls have given rise to the formation of branded stores, specialty stores, departmental stores, supermarkets, hypermarkets, and convenience stores. Subsequently in Kolkata there has been a rise in stores like Big Bazaars, Spencers etc. This trend has become popular in the Kolkata Metropolitan area with a lot of branded, convenience and lifestyle stores popping up. This transformation has had a deep impact on the lifestyle of the people and influenced the shopping culture of the city. Thus, urban form and image of the city has modified eventually.

4.4 Kolkata and Urban Development

Kolkata, the capital of the state of West Bengal has been one of the first Colonial cities and former capital of India. The urban history of Kolkata starts when the English traders stuck in a stormy river journey decided to halt at Sutanuti around 1750s. The Mughal Emperor Farrukshiyyar granted the land rights to the British of Gobindapur, Sutanuti, Kolkata and 24 adjoining villages. This helped the British to start the foundations of the city. Firstly, the British shifted the Old Fort to Fort Willian which was separated by the Maidan. The Maidan was created by clearing a forest around the area. The city centre at Dalhousie was first set of buildings that were built. The Governor's house, the Writer's quarters, banks, the great Tank and a few mansions were the most notable buildings. This entire area was known as White Town. The native town known as Black Town always existed as Sutanuti which was a trading town. With the settlement of the British, the town prospered into a buzzing commercial centre rivalling Chittagong which was a popular colonial trading destination of the other European settlers.

To increase connectivity Howrah Station was built, which sped up the process of urbanization. Kolkata quickly transformed from a trading town to a bustling city. The British contributed to urban planning of the city. Dalhousie Square formed the administrative heart of the city with the Laal Dighi to Great Tank at its centre surrounded by important buildings around it. The CC of Chandni chowk and Burrabazar were located around this area. The Chitpur Road was the orconnected Sutanuti town to the surrounding trading towns. The city was divided in a grid iron pattern of different thanas governed by the municipality. Kolkata became a corporation body on 4 September 1726, comprising a mayor and nine aldermen. The role of Calcutta Municipal Corporation was to regulate the development and urban governance of the city.

When the British transformed the city into the Capital of India, they set up the Calcutta Improvement Trust (C.I.T) in 1911, following the other colonial cities in India like Bombay and Madras for development of urban infrastructure. Along with this rehabilitation projects and commercial complexes was also part of the initial program. The C.I.T was instrumental in creation of development zones which saw microscale urban planning projects being implemented across the city. The Southern Avenue, Park Circus and Beliaghata were the most notable zones of development. Town Planning Scheme of 1916 was a guiding framework of urban development for Kolkata. The city centre was designed around Dalhousie Square and the entire city generated from it. The existing areas of the black town were seamlessly incorporated into the city structure. Other important developments were the formation of the Central Avenue which runs parallel to the Rabindra Sarani and Acharya Jagadish Chandra Bose Avenue which further strengthened the grid iron structure of the city. The Area Improvement Plan of Bhawanipore was also guided by the same document. The Improvement Plans were based on the ideology of work-living-leisure as neighbourhoods were planed and restructured in various parts of the city to include adequate openspace and housing zones near or around commercial centres. This aided to the cohesive and integrated urban character of the city. Due to trade and related networks the area along the banks of the Hoogly also started flourishing. Older colonial settlements of Chandannagore, Chinsura, Barrackpore etc. started forming a daily necessary route for commercial activities via road and the waterways. The shift of capital from Kolkata to Delhi did not deter the importance and growth of the city as it turned to become the commercial and industrial centre in the East.

Independence in 1947 and the 1971 Bangladesh war had enormous effects on the growth of the city- There was a huge in migration of people during these two events. Kolkata was the only metropolis in the East which triggered large scale crowding, housing shortage, economic crisis, poverty, and unemployment. The 1951 Census shows that out of 2,099,000 migrants, around 66% settled in just three districts of West Bengal – 25% settled in 24 Parganas districts, 21% in Kolkata and 20% in the Nadia district (Mitra, 2016). The city was forced to go into unplanned haphazard development during these two periods in history marred by frequent cholera epidemics. This led to the formation of Calcutta Metropolitan Planning Organization (CMPO) in 1962 which gave rise to Basic Development Plan (BDP) for Calcutta Metropolitan District: 1966 – 1986, guided by Ford Foundation. BDP suggested a Dual Center Development Strategy: one at Kolkata-Howrah Metropolitan core, and the other at Kalyani Bansberia area.
The schemes of the CIT would still shape the city up till 1976. Surtibagan Area improvement was the 1st scheme of the CIT, the 2nd scheme was at the Shyambaar Area. The last scheme of the CIT was at the Kasba-Rashbehari connector in 1976. This connector facilitated the Eastern Metropolitan Bypass making it easier to traverse between the North and South of the extended metropolis. The rapid increase in the population and the state of the urban poor gave rise to planning for the low-income groups of the city. This gave way to the planning of the satellite city of Saltlake. This design focused not only housing the lower income groups but also improve the living conditions of the city. In this regard, the concept of the city was based on the Garden city concept. But the plots were commissioned to the population via lottery which tipped the scales of the plots to the upper middle class and the rich. The city was economically dependent on Kolkata. The city gradually became a residential extension with certain administrative activities. It had institutional areas for neighbourhood schools and block markets for commercial activities and daily need. But the idea of mixed use was not previously encouraged by the building rules making it a contrasting locality as compared to its mother city Kolkata. With the opening of markets and the advent of globalization, commercial activities flourished and Saltlake became a more active settlement with commercial buildings like City Centre, shops, and restaurants.

The KMPO and later KMDA formed various development plans for the city over the years. The 1976 Development Perspective Plan (DPP) focused on Kolkata-Howrah was the major center with 26 sub-centers of which 12 were on the west bank of river Hoogly. Preferred Structure Plan Multi-Center Development strategy prepared by the KMDA in 1987 developed

various sub-centres in the Kolkata Metropolitan Area surrounding the main city of Kolkata. The aim was to ease the pressure off the main centre of Kolkata and over time it has helped the metropolis to expand the way it has today. Only recently has the other centres become more active as supporting centres as seen through the development of new high-rise residential and commercial areas.

The next Perspective plan of 2011 had a 3-fold planning strategy. Firstly, delineation of three levels of Kolkata Metropolitan Regions was proposed. Secondly, development of a hierarchical system of settlement pattern, in the Inner Metropolitan Region within the orbit of 50 km radius from Rajbhawan including KMA, was considered as a regional plan action. Thirdly, proposal of 2 million-plus population cities - one at Uluberia - Bagnan and the other at Barasat-Barrackpur area with a vision to acquire a robust urban system consisting of Kalyani, Barrackpur, Barasat and Salt Lake in order to de-congest Kolkata- Howrah Metro Center. High speed transportation corridor was proposed, part of which are already available or under construction. The latest Perspective Plan known as the Vision 2025 outlines the role of the Kolkata Metropolitan Area as the national centre for trade, commerce, and industrial activities. It also states that one of its major functions is to act as the central market for the entire eastern region and is a hub for regional, national, and international traffic, goods and service. In this regard, the plan looks at development of the city under the following few development strategies.

1. Decentralized Urban Planning & Development
2. Urban land Use Policy
3. Strategies for development of Infrastructure.
4. Strategies for Resource Mobilisation.
5. Affordable Technology.
6. Private Sector Participation in Infrastructure Development.
7. Targeting the Urban Poor for Redistributive Justice.
8. Protection and Conservation of Environmental Heritage.

The Vision 2025 takes forward the previous plans. The plan recognizes that the liberalization of economic policies provides the opportunity of private investment in economic activities which plays a major role in economic development of KMA and the state. In a significant strategy under Urban Landuse policy the focus on economic development was taken forward

with the proposal of the new CBDs and metro centres. This has led to the development of new extensions like Kalyani, Saltlake and most recently Rajarhat New Town. From contemporary research in this regard all studies show there has been rapid urbanization in the period from 1990 to 2019. The following tables demonstrates the urbanization growth rate of the city.

Sl, No.	Year	Built up Area (ha.)	Total Area (ha.)	% Land Cover
1.	1991	23,834	125,825	19
2.	2001	28,516	125,825	23
3.	2011	60,482	125,825	48
4.	2018	72,083	125,825	57

Table 4-1: Urbanisation growth in Kolkata

Source: Mandal (2019), Journal of the Indian Society of Remote Sensing

Further studies of building density amongst all the municipalities, the most change in the building activity has vastly increased in Kolkata and the surrounding municipalities and the higher percentage of this growth has been in the transitional and peripheral areas. This indicates that the planning for urban centres in the past two Perspective Plans have started to gain stream which has in turn increased investment in real estate. If the commercial built-up is studied for the past few years one can see that there has been steady rise in the supply of commercial space in the city. Most of the commercial real estate has been specifically for office space investment. Initially around 2010-12 commercial real estate leasing activity was 1.5 million sq.ft. per year , from 2012-15, this average came down to 1 million sq ft per year, from 2016 to 2018, to 0.8-0.9 million sq ft. But in 2019 there has been an upward growth curve in the consumption of office space as the vacancy rate declined from 38.1% to 35.7% (Cushman & Wakefield, 2019). In retail commercial built-up area, there is no new malls expected to come up in Kolkata in 2019 while between 2021 and 2022, around. 2.4 million sq ft of new mall supply is proposed to be built. On the other hand, irps also to be noted that vacancy levels of malls in key Kolkata has alsp been rising year-on-year. From 12 per cent in 2016 to 13 per cent in 2017, it stood at 17 per cent in 2018. This is the second highest among the top 7 cities. (Business Line, The Hindu, 2019)

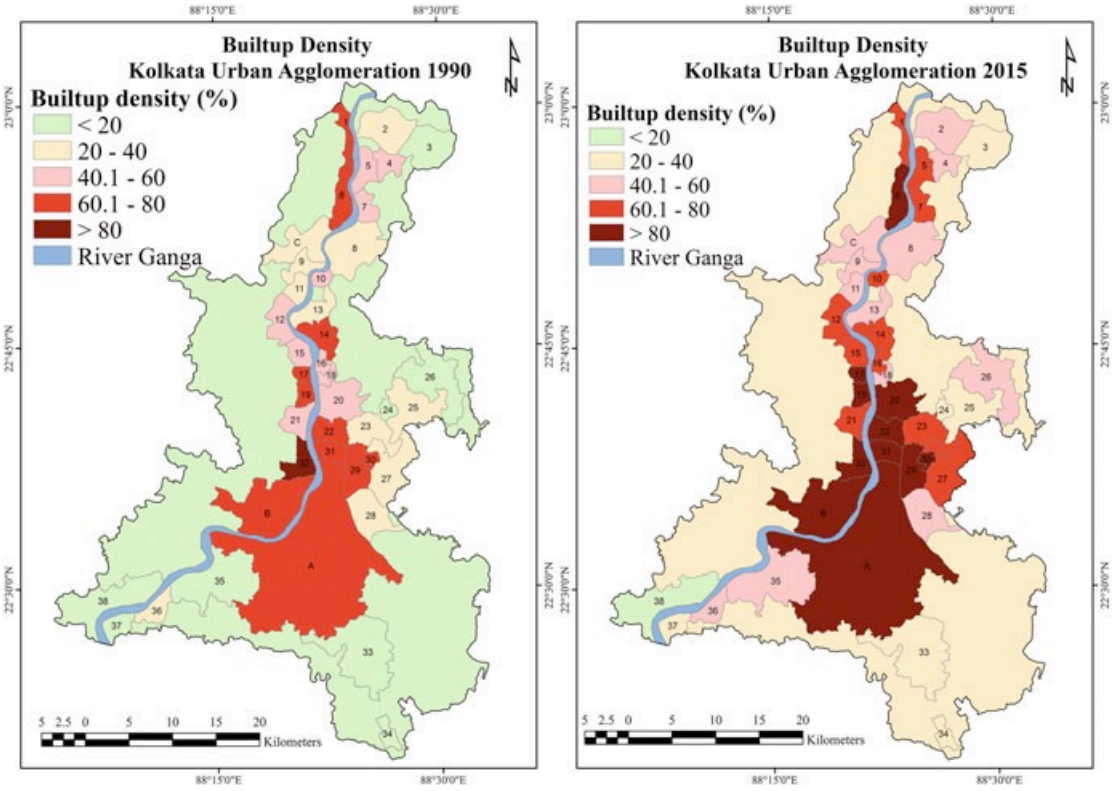


Figure 4-2: Comparison of Building densities in KMA between 1990 and 2015.
(Source: Rahman (201 9), Applications and Challenges of Geospatial Technology, Springer.)

Based on the above explorations, it is imperative to understand the transformation of retail Commercial centres in Kolkata and the direction of development from an urban design point of view. The methodology undertaken for the survey is as to select markets and malls in Kolkata and study them based on the parameters derived in Chapter 03.

4.5 Selection and analysis

The area considered for study of commercial centres and their transformation in Kolkata is taken to be in and around the main city. For this purpose, the municipalities of Kolkata, North and South Dum Dum, Baranagar, Howrah, Bally, Belur, Saltlake, New Town and Rajpur-Sonarpur have been considered. The CC in the form of markets and malls have been identified and mapped with the help of the municipal data and literature resources. A diagrammatic representation of the CC in and around Kolkata is shown on the following figure.

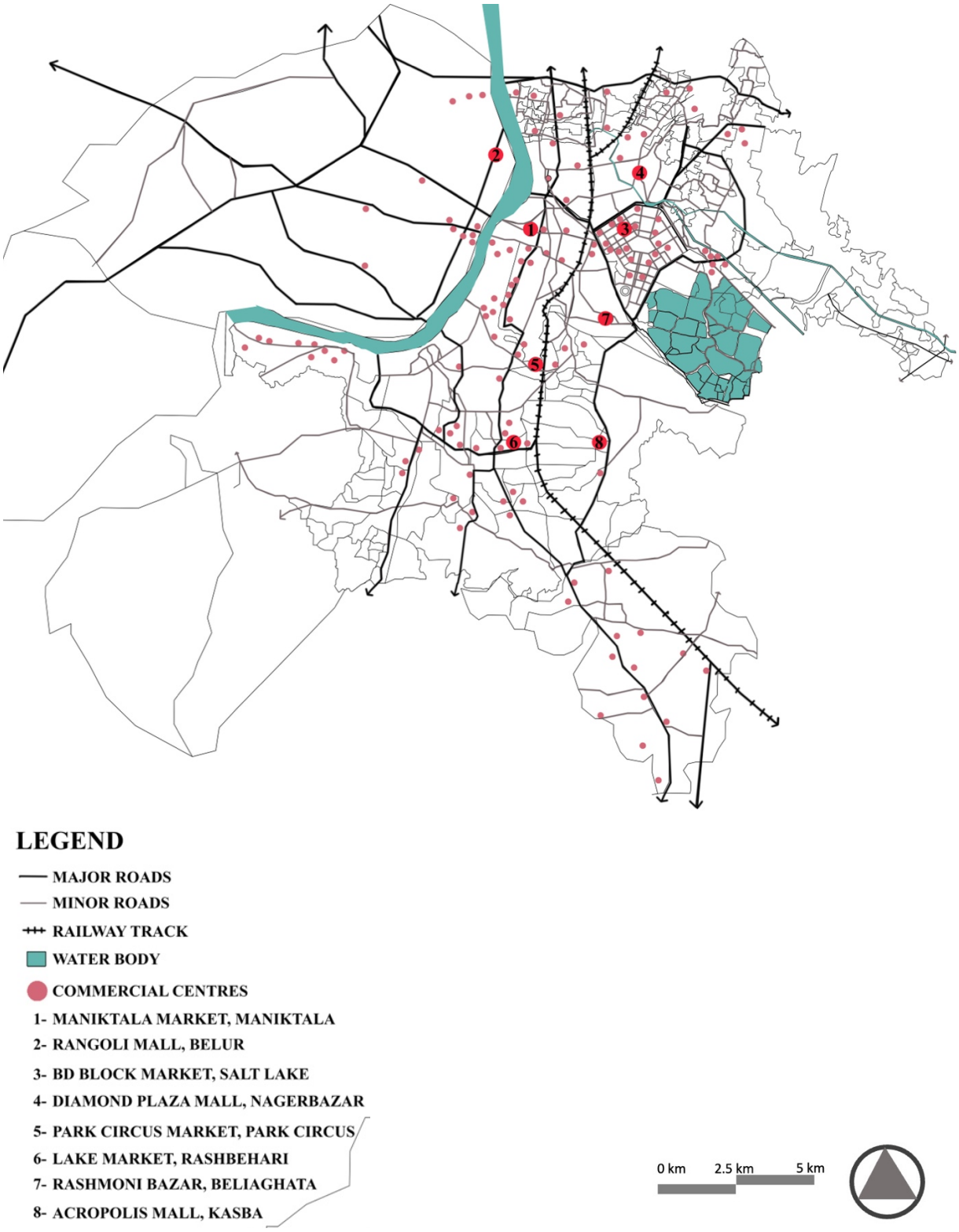


Figure 4-3 : Map showing all CC in Kolkata and adjoining areas with selected CC for on-site study. (Source: Municipal data sourced and map generated by Author.)

To the study, 8 sites have been chosen amongst the commercial centres in Kolkata. These markets have been chosen based on the different time periods in which they had been established. They are all Community Shopping Centres in the form of markets (old CC) and shopping malls (new CC) and cater to neighbourhoods with population 100000. Transformation in the pattern of market development can be studied through parametric study. The markets have been geographically categorized considering the municipal limits as mentioned above.

The North Kolkata Markets can be further clubbed into the North-West and North-East to understand the type of transformations the city has gone through geographically include:

A. North-West Kolkata

- Maniktala Market, Maniktala.
- Rangoli Mall, Belur.

B. North-East Kolkata

- BD Block Market, Saltlake.
- Diamond plaza Mall, Nagerbazar.

The South Kolkata Markets can be further clubbed into the South-West and South-East to understand the type of transformations the city has gone through geographically include:

C. South-West Kolkata

- Park Circus market, Park Circus.
- Lake Mall, Rashbehari.

D. South-East Kolkata

- Rashmoni Bazar, Beliaghata.
- Acropolis Mall, Kasba.

Each of the CC are surveyed and analyzed considering the areas that fall **within immediate walking distance of 500 metres** to study the transformation occurring due to the CC in its surrounding context. The following sub-sections will record the study and analysis from data collected from each market.

4.5.1 Case Study Area A: North-West Kolkata

4.5.1.1 Selection

4.5.1.1.1 Maniktala Market (MM)

a. Description

Figure 4-4 : Image of Maniktala Market (MM).(Source: Author.)

Maniktala Market henceforth referred to as MM is located at 187, Vivekananda Road and is a private market spread over 3 acres. Vegetables, fruits,betel leaf, flowers, fish, meat, egg etc. are available. Maniktala market, along with Hatibagan, Sealdah, Lake Market and Gariahat markets, is amongst the largest markets in Kolkata. Historically this market started to develop around 1784-85 when Kolkata started to become more populous due to increase in trade amongst the Mughal monarchy and the European traders specially the British. By 1830, the condition of the markets in Kolkata deteriorated and there was a drive to uplift the condition of the markets. In 1841, the Bengal Gazetteer and the Municipal Corporation listed Maniktala market then known as 'Hedua bazar' as one of the most important marked as per popularity. Under the guidance of Raja Radhakanta Deb and estate manager Anandakrishna Bose, Maniktala market got renovated in accordance to the rules laid down by the Municipal Corporation.

b. ***Delineation***

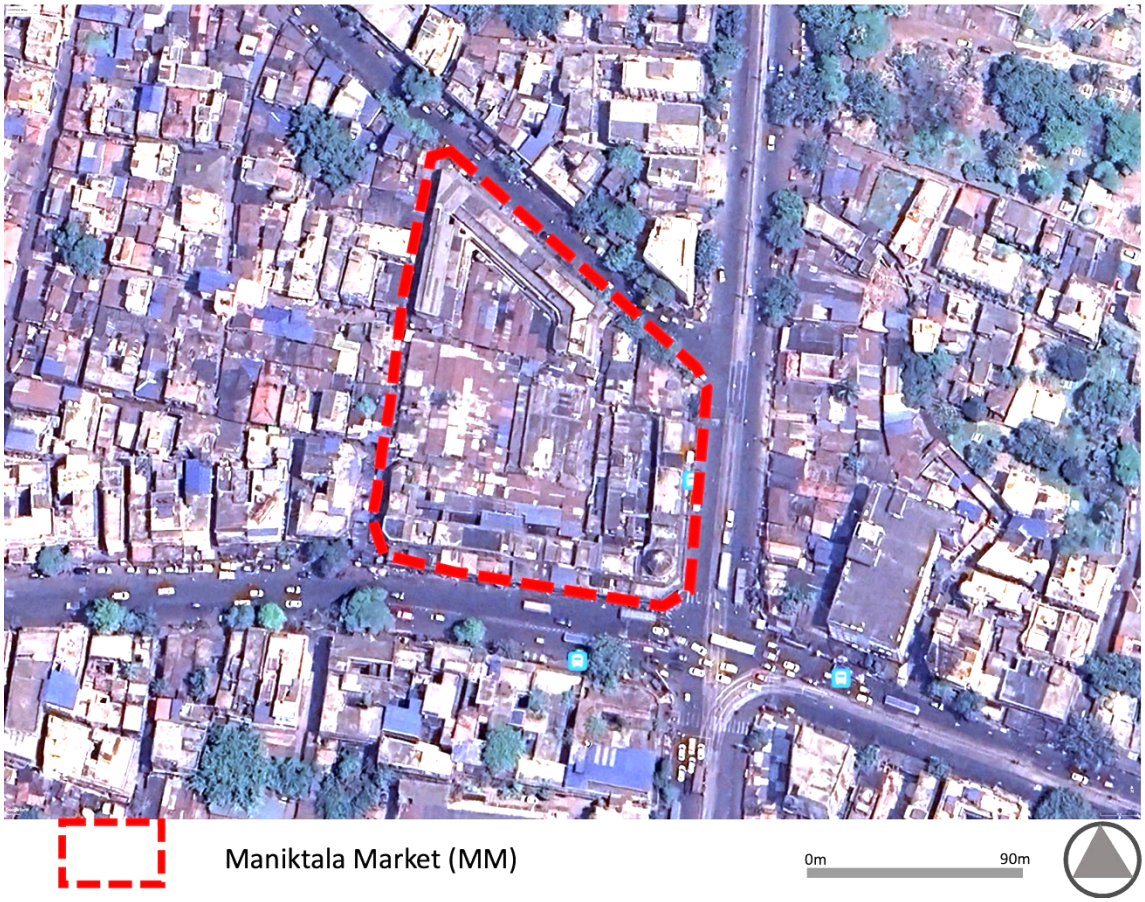


Figure 4-5 : Satellite image of Maniktala Market (MM).(Source : Generated by Google maps)

The market is in the important crossing of Acharya Jagadish Chandra Bose Road on the east and Vivekananda Road on the south, both major arterial roads. The surrounding areas are essentially residential neighbourhoods along with some commercial areas. The urban fabric is compact and has many old buildings. The market has a clocktower at the crossing which gives it a distinct feature.

The following map shows the immediate influence area of the market within walking distance (500 m). Subsequently a map for building use has been generated to see the functional distribution that has occurred or is being influenced by this market.

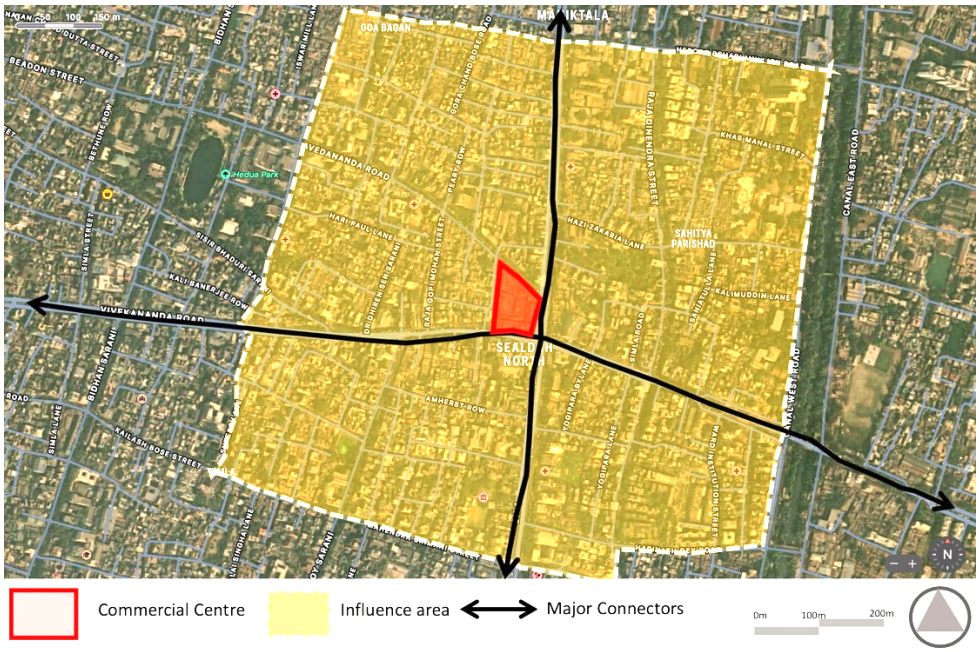


Figure 4-6 : Satellite Image of Maniktala Market and its immediate influence area. (Source: Generated through Apple maps)

Figure 4-7: Building use distribution of area around Maniktala Market, (Source : Author)

Building use type	***Residential***	***Mixed Use***	***Commercial***	***Institutional***	***Industrial***	***Others***
% Land area covered	***57.23***	***8.75***	***1.01***	***1.74***	***0.52***	***30.75***

Table 4-2: Building use distribution of area around Maniktala Market,(Source : Author)

4.5.1.1.2 Rangoli Mall, Belur. Howrah (RM)

a. Description

Figure 4-8: Exterior View of Rangoli Mall (RM).(Source : Author).

Rangoli Mall henceforth referred to as RM is in Belur, Howrah which is a part of the Kolkata Metropolitan Agglomeration Area. The mall was situated in 2015 and was the first of its kind to come up in Howrah in this scale. It is a part of the Forum group which built the first mall in Kolkata. The 3.5 lakh square feet mall, a three-screen multiplex, and big names in retail like Spencer's, Shoppers Stop and Reliance Trends. This was the first mall of its kind to be built in this location and gained a lot of crowds. It had one of the highest footfalls in malls in 2019-2020. It helped in the spread of such commercial building types along this region. The need to essentially travel to the main city to enjoy modern amenities was reduced due to the presence of this mall. Hence, this become a relevant mall to study transformation of CC.

b. Delineation

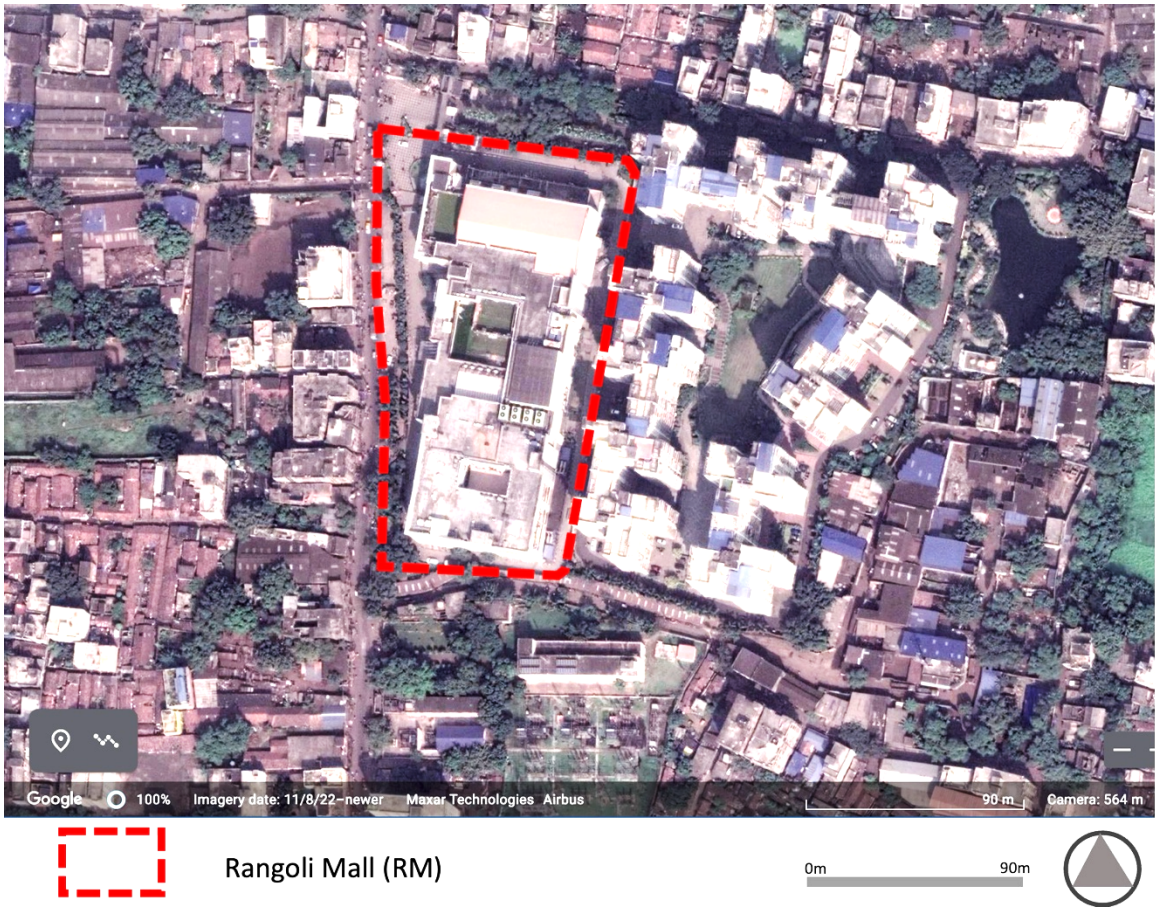


Figure 4-9 : Satellite image of Rangoli Mall (RM). (Source : Google maps)

The mall is located along the Girish Ghosh Road which runs parallel to the Grand Trunk Road which is the major arterial road. It is surrounded by residential neighbourhoods and old factories. The Belur Math is located on the way to the site which is one of the biggest tourist spiritual centres in Eastern India. It is designed as the commercial component of a housing complex, a very common format followed in and around the city.

The following map shows the immediate influence area of the shopping mall within walking distance (500 m). Subsequently a map for building use has been generated to see the functional distribution that has occurred or is being influenced by this mall.

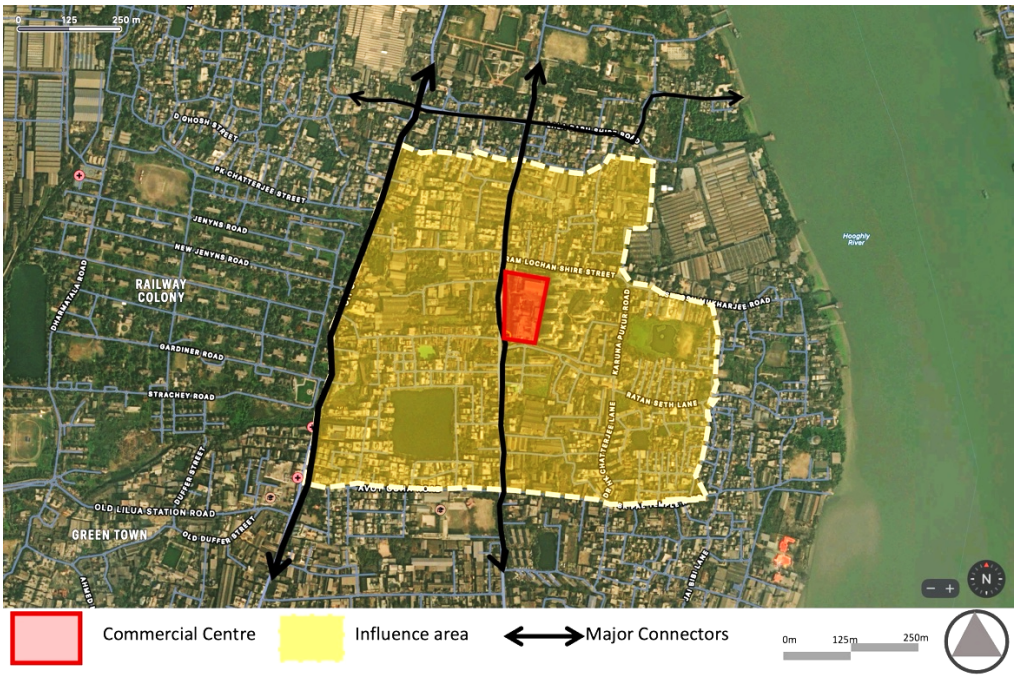


Figure 4-10: Satellite Image of Rangoli Mall and its immediate influence area. (Source:Generated through Apple maps.)

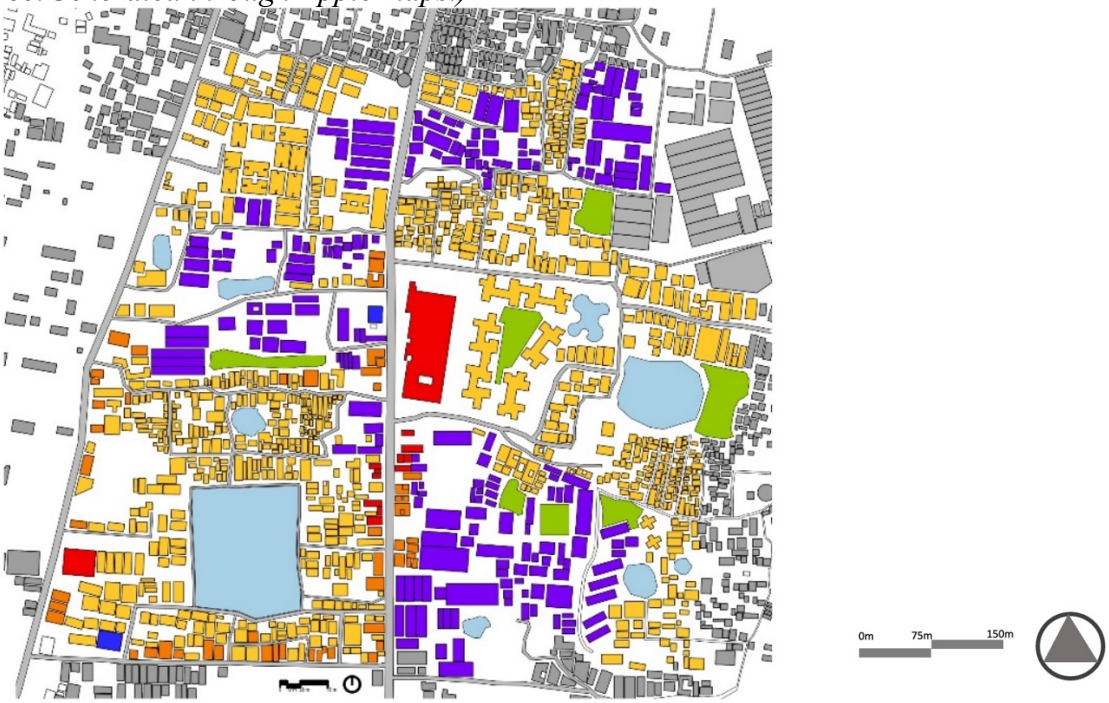


Figure 4-11: Building use distribution of area around Rangoli Mall, Source : Author

Building use type	***Residential***	***Mixed Use***	***Commercial***	***Institutional***	***Industrial***	***Others***
% Land area covered	*30.97*	*1.79*	*1.67*	*5.67*	*12.65*	*47.25*

Table 4-3: Building use distribution of area around Rangoli Mall,(Source : Author)

4.5.1.2 Study & Analysis

The markets in **Case Study Area A** have been studied based on the parameters chalked out in Chapter 3. The table of observations for the same has been studied based on the major three parameters – Vitality, Livability and Sense of Place.

The tables of observations showcasing the parameter **Vitality for both MM and RM** are given below.

Parameter	**VITALITY**								
Sub-parameter	**Activity**								
Variables	Quantitative		Qualitative						
	Built Use (in %)	**Pedestrian Flow**	**Nature of Commercial Activity (In %)**		**Product Mix (in numbers)**				
		people/minute	Formal	Informal	Groceries and Household	Garments	Medicine shops	Food	Entertainment
Area - North-West Kolkata									
Site - Maniktala Market									
2022	Commercial: 1.35% Mixed Use: 8.75%	96.07	70%	30%	177	68	15	28	0
2021	Commercial: 0.9% Mixed Use: 8.75%	67.15	65%	15%	97	43	13	10	0
2019	Commercial: 1.3% Mixed Use: 9.13%	103.3	67%	33%	169	75	13	21	0
Site - Rangoli Mall									
2022	Commercial: 1.73% Mixed Use: 1.85%	78.35	80%	20%	1	25	3	23	3
2021	Commercial: 1.67% Mixed Use: 1.5%	40.33	55%	20%	1	20	3	10	3
2019	Commercial: 1.67% Mixed Use: 1.79%	115.22	70%	30%	1	38	3	23	5

Table 4-4: Survey table for the parameter Vitality and sub-parameter Activity. (Source: Author)

Parameter	VITALITY			
Sub-parameter	Public Space			
Variables	Quantitative		Qualitative	
	Formal Public space	**Informal Public Space**	**Type of Formal Public space**	**Type of Informal Public Space**
	sqm	sqm		
Case Study Area (A) - North-West Kolkata				
Site - Maniktala Market (MM)				
Observation	119079.5	18417.7	Very few green playgrounds. City level formal public spaces in the vicinity	Mostly informal street shopping encouraging commercial activity.
Site - Rangoli Mall (RM)				
Observation	69862	10614	Mostly waterbodies and some playgrounds	Undefined open spaces and on street shopping.

Table 4-5: Survey table for the parameter Vitality and sub-parameter Public Space. (Source: Author)

The tables of observations showcasing the parameter **Liveability for both MM and RM** are given below.

Parameter	LIVEABILITY							
Sub-parameter	Location							
Variables	Quantitative		Qualitative					
	Size of Commercial Centre (sqm)	**Distance from City Centre (Km)**	**Routes- Area level**	**Routes- Area level (in numbers)**				**Layout**
				Major Arterial Road	Arterial Road	Sub Arterial Road	Collector road	
Case Study Area (A) - North-West Kolkata								
Site - Maniktala Market (MM)								
Observation	2565.00	3	2 major arterial roads (24 m wide APC road & 20 m wide Bidhan Sarani)	2	0	1	1	2 storeyed U-shaped building, 1 storey market, informal shops
Site - Rangoli Mall (RM)								
Observation	32516.06	7.1	1 Secondary road (Girish Ghosh Road)	0	0	1	1	5 storeyed linear rectangular

Table 4-6: Survey table for the parameter Liveability and sub-parameter Location. (Source: Author)

Parameter	**LIVEABILITY**												
Sub-parameter	**Accessibility**												
Variables	Quantitative		Qualitative										
	Min. Distance of facilities from neighbourhoods	**Time taken to access**	**Routes- Site level (in numbers)**					**Mode of Travel (% number of total vehicles)**					
	X (in metres)	Y(in mins)	Major Arterial Road	Arterial Road	Sub Arterial Road	Collector road	Entry Points	Bus	MRTS	Auto	Cars	Bikes and bicycles	Pedestrian
Case Study Area (A) - North-West Kolkata													
Site - Maniktala Market (MM)													
2022	200	5.00	2	0	1	1	5	10	0	10	10	25	45
2021			2	0	1	1	3	10	0	10	5	30	45
2019			2	0	1	1	5	10	0	15	5	25	45
Site - Rangoli Mall (RM)													
2022	700	10.00	0	0	1	1	4	10	0	25	30	20	15
2021			0	0	1	1	2	20	0	15	30	20	15
2019			0	0	1	1	4	20	0	25	20	20	15

Table 4-7: Survey table for the parameter Liveability and sub-parameter Accessibility. (Source: Author)

Parameter	**LIVEABILITY**						
Sub- parameter	**Safety**						
Variables	Quantitative			Qualitative			
	Natural Surveillance	**Mechanical Surveillance**		**Type of Pathway**		**Type of Lighting**	
	No of Active Frontages (nos.)	Patrol Booths (nos.)	CCTV Cameras (nos.)	Open (nos.)	Closed (nos.)	Halogen Streetlights (nos.)	LED Lights (nos.)
Case Study Area (A) - North-West Kolkata							
Site - Maniktala Market (MM)							
Observation	38	2	3	4	0	14	36
Site - Rangoli Mall (RM)							
Observation	5	1	5	1	3	3	4

Table 4-8: Survey table for the parameter Liveability and sub-parameter Safety. (Source: Author)

The tables of observations showcasing the parameter **Sense of Place for both MM and RM** are given below.

Parameter	SENSE OF PLACE				
Sub- parameter	Urban Form				
Variables	Quantitative			Qualitative	
	Street Width	**Building Height**	**Building Front Offset**	**Edge**	**Shape**
	metres	metres	metres		
Case Study Area (A) - North-West Kolkata					
Site - Maniktala Market (MM)					
	20	9	0	Permeable	Rectangular
Site - Rangoli Mall (RM)					
	15	16	6	Defined, Controlled permeability	Linear

Table 4-9: Survey table for the parameter Sense of Place and sub-parameter Urban Form. (Source: Author)

Parameter	SENSE OF PLACE						
Sub- parameter	Visibility						
Variables	Quantitative			Qualitative			
	Maximum Distance of Visibility (metres)	**Height of visibility (metres)**	**Angle of Visibility (degrees)**	**Presence of Obstruction**			**Vista and Skyline**
				Trees (nos.)	Placards (nos.)	% of façade under obstruction	
Case Study Area (A) - North-West Kolkata							
Site - Maniktala Market (MM)							
	210	8 m	10	4	19	68%	Terminating Vista with prominent landmark
Site - Rangoli Mall (RM)							
	80	16	30	10	18	40%	Linear Vista

Table 4-10: Survey table for the parameter Sense of Place and sub-parameter Visibility. (Source: Author)

Parameter	SENSE OF PLACE							
Sub-parameter	Imageability							
Variables	Quantitative				Qualitative			
	No of Defined Edges (nos.)	**No. of nodes (nos.)**	**No. of pathways (nos.)**	**No. of Landmarks (nos.)**	**District**	**Edge**	**Landmark**	**Type of Node**
Case Study Area (A) - North-West Kolkata								
Site - Maniktala Market (MM)								
	2	1	5	7	Residential	partially defined	Corporation Market, Clocktower	City Level Node
Site - Rangoli Mall (RM)								
	4	0	2	2	Industrial	defined	Belur Math, Factories	Local Node

Table 4-11: Survey table for the parameter Sense of Place and sub-parameter Urban Form. (Source: Author)

4.5.1.3 Inferences

The main inferences from **Case study area A** based on the parameter of Vitality are as follows:

Vitality:

a. MM caters to a larger area of residential population as compared to RM. The public places generated in and around the area of MM is more widespread than RM.

b. The mixed building typology of the area around RM, gives rise to creation of gated communities and thus restricts continuity of public space. However, in case of MM, traditional built-to-edge typology facilities mixed use creation giving rise to continuous public space increasing the vitality of the area.

Liveability:

a. MM is located at cross-roads of 2 major arterial roads which makes it more noticeable than RM which is located on a linear stretch of road.
b. The building layout for MM is a 2 storeyed box which is easier to access but RM has a higher building height which makes its location easily discern able.
c. There are a greater number of entries in MM is much greater which makes it more accessible whereas there is restricted entry in RM.
d. MM can be accessed from all directions and all pathways are open pathways, whereas in RM like in all other malls is accessed by only 2 pathways front and side. This renders MM to be safer than RM in this respect as it has a better eye on the street condition.
e. Formal Surveillance in better and more structured in case of RM as compared to MM.

Sense of Place:

a. MM has a permeable edge whereas RM has a defined edge with controlled permeability which increases the sense of place or belonging for MM as compared to RM.
b. The rectangular shape of the urban form of MM contributes to centrality making the sense of place aspect stronger than that of the linear RM.
c. MM has been a prominent landmark over a long period of time located on a city level node with organized public spaces around the area. Whereas RM is also located near a prominent landmark (Belur Math) but the linear shape of the urban form makes it less understandable as an urban place.

4.5.2 Case Study Area B: North-East Kolkata

4.5.2.1 Selection

4.5.2.1.1 BD Market, Saltlake.(BD)

a. ***Description***

Figure 4-12 : External view of BD Market. (Source : Author)

This market is situated in planned city of Saltlake, Kolkata. The city of Saltlake is divided into blocks and 16 markets have been distributed around these blocks. The biggest market among all these markets is the BD block market. This market serves at least four blocks of residential blocks. These markets have been the only commercial areas in the satellite city of Saltlake. The location and size of this market makes it one of the most favoured commercial locations in and around Saltlake. This market follows the standard building layout like the other block markets in Saltlake. The market has a central entrance and 2 side entrances. Along with perishable items there are shops related to grocery, stationary, medicines, garments etc.

b. Delineation

Figure 4-13: Satellite image of BD Market (BD). (Source : Google Maps)

The market is located at the junction of BD and CD blocks of Saltlake city. The It is surrounded by residential areas. It is connected to the main arterial road of Saltlake. The nearest markets are the CA block market and AE block markets. The City Centre is also located within 500 m of the market. The BD, AD, CD, BC, BE and CE blocks form the network of this market.

The following map shows the immediate influence area of the market within walking distance (500 m). Subsequently a map for building use has been generated to see the functional distribution that has occurred or is being influenced by this market.

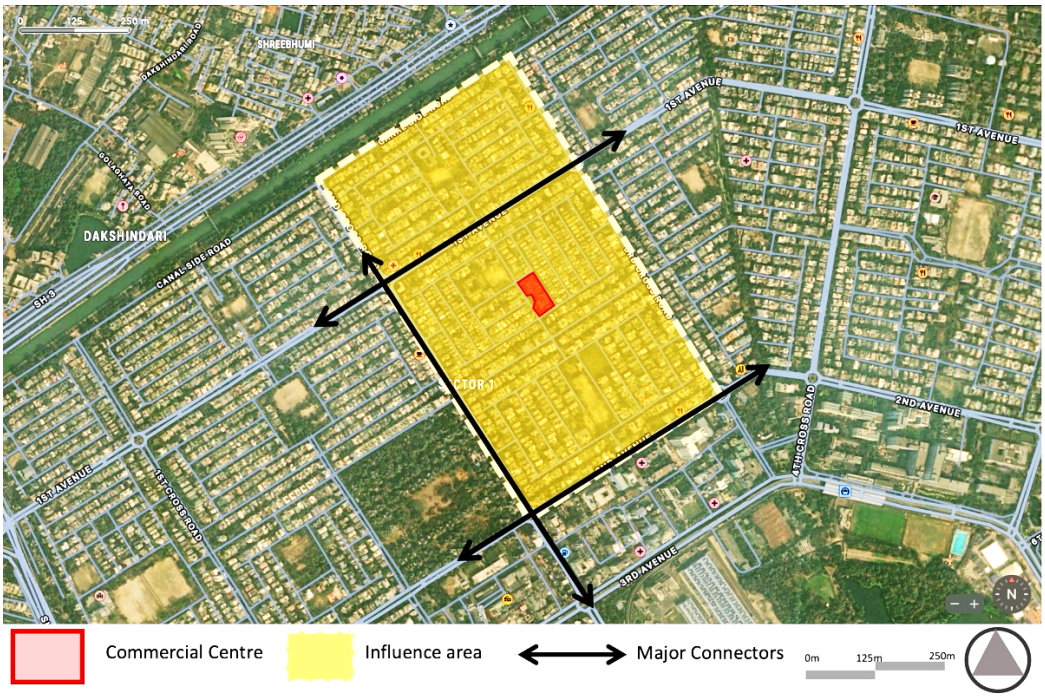


Figure 4-14 : Satellite Image of BD Block Market and its immediate influence area.(Source: Generated through Apple maps.)

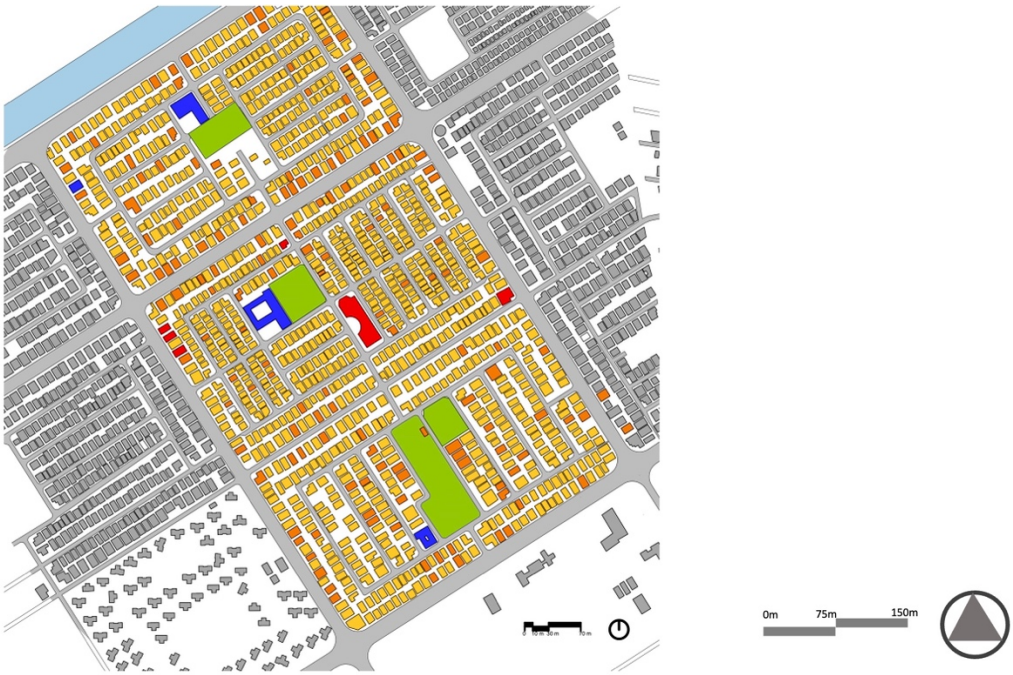


Figure 4-15: Building use distribution of area around BD Market,(Source : Author)

Building use type	***Residential***	***Mixed Use***	***Commercial***	***Institutional***	***Industrial***	***Others***
% Land area covered	*58.24*	*4.66*	*0.59*	*0.78*	*–*	*35.73*

Table 4-12: Building use distribution of area around BD Block Market, (Source : Author)

4.5.2.1.2 Diamond Plaza, Nagerbazar (DP)

a. Description

Figure 4-16: External view of Diamond Plaza Mall. (Source:https://www.mappls.com/place-diamond+plaza+nagerbazar-jessore+road-satgachi+Kolkata)

The Diamond Plaza is situated in Nager Bazar along Jessore Road. It can be described as a Food, Entertainment and shopping destination in North Kolkata. It was inaugurated in September 2012 and is managed and operated by Future Group. The built-up area of the mall is about 3 lakh sq. ft. Overtime this has become one of the popular malls in North Kolkata. The mall is located on one of the busiest streets in the city which also has a street market along it. This has helped the mall to flourish. Other commercial areas along the street also came up due to growing popularity of the mall.

b. Delineation

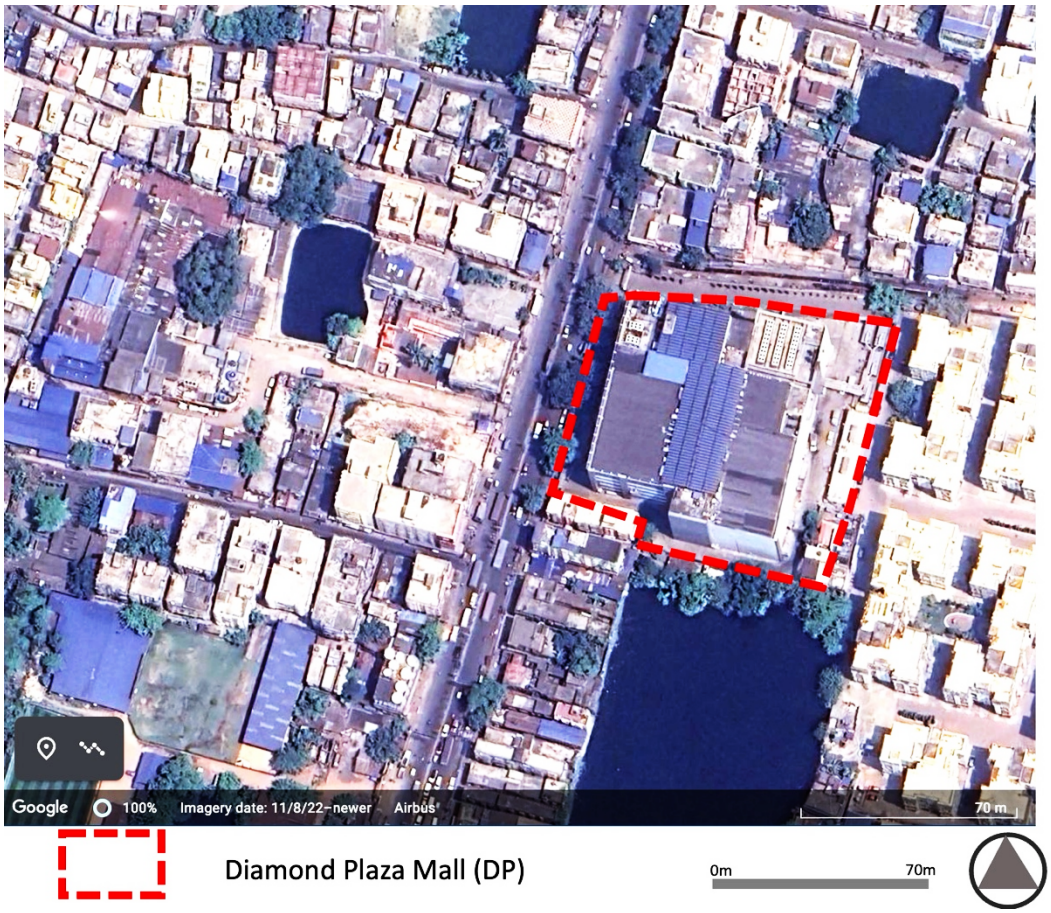


Figure 4-17 : Satellite image of Diamond Plaza Mall (DP).(Source : Google Maps)

Diamond Plaza is a part of a residential real estate project known as Diamond City which is located along Jessore Road which connects to the Airport. The surrounding area is primarily residential in nature. There are connector roads through the neighbourhoods that connect to VIP road which runs parallel to the Jessore Road. The edge conditions can be defined as the Keshtopur Khal to the South and Nager Bazar in the North.

The following map shows the immediate influence area of the shopping mall within walking distance (500 m). Subsequently a map for building use has been generated to see the functional distribution that has occurred or is being influenced by this mall.

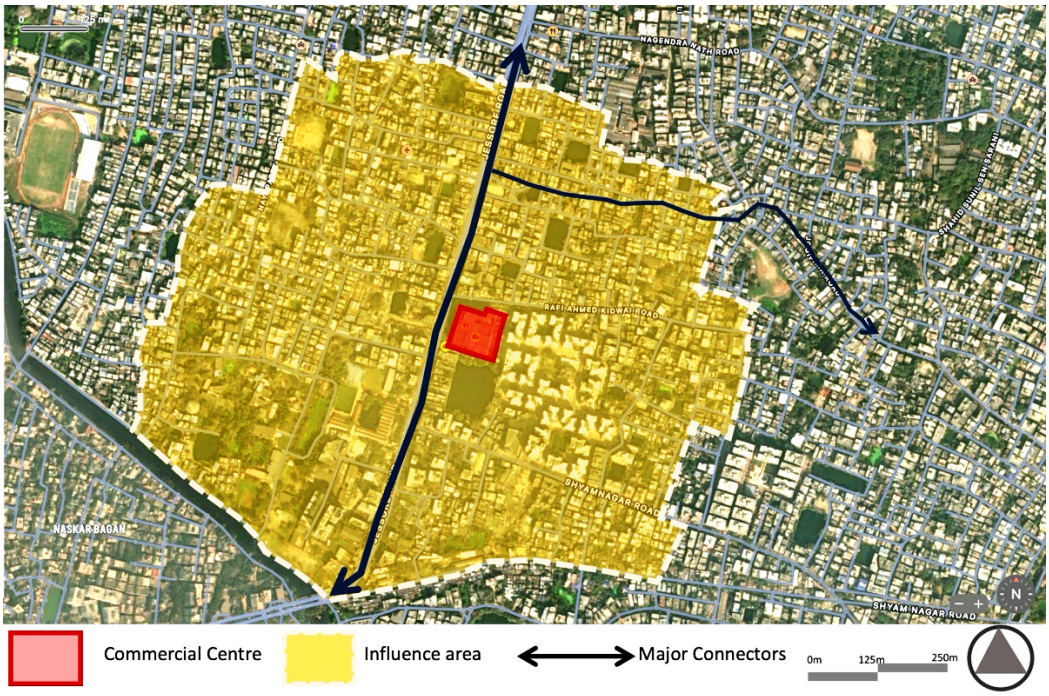


Figure 4-18 : Satellite Image of Diamond Plaza Mall (DP) and its immediate influence area. (Source:Generated through Apple maps)

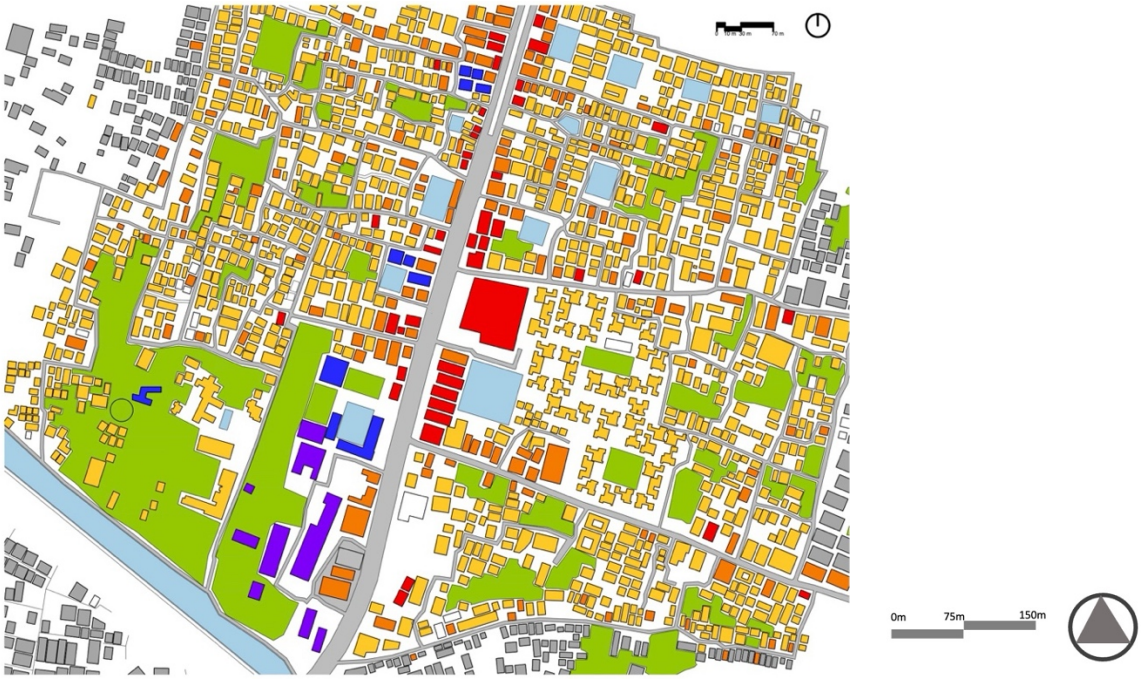


Figure 4-19: Building use distribution of area around Diamond Plaza Mall,(Source : Author)

Building use type	***Residential***	***Mixed Use***	***Commercial***	***Institutional***	***Industrial***	***Others***
% Land area covered	*38.50*	*4.36*	*2.13*	*1.03*	*0.62*	*53.36*

Table 4-13: Building use distribution of area around Diamond Plaza Mall. (Source : Author)

4.5.2.2 Study & Analysis

The markets in **Case Study Area B** have been studied based on the parameters chalked out in Chapter 3. The table of observations for the same has been studied based on the major three parameters – Vitality, Livability and Sense of Place.

The tables of observations showcasing the parameter **Vitality for both BD and DP** are given below.

Parameter	VITALITY								
	Activity								
	Quantitative		Qualitative						
	Built Use (in %)	**Pedestrian Flow**	**Nature of Commercial Activity (In %)**		**Product Mix (in numbers)**				
Attributes		people/minute	Formal	Informal	Groceries and Household	Garments & Lifestyle	Medicine shops	Food	Entertainment
Case Study Area (B) - North-East Kolkata									
Site - BD Block Market (BD)									
2022	Commercial: 0.66% Mixed Use: 4.66%	21.94	95%	5%	74	9	1	6	0
2021	Commercial: 0.59% Mixed Use: 4.66%	15.24	80%	0%	58	7	1	2	0
2019	Commercial: 0.59% Mixed Use: 4.66%	30.47	95%	5%	74	7	1	4	0
Site - Diamond Plaza Mall (DP)									
2022	Commercial: 2.24% Mixed Use: 4.4%	109.46	80%	20%	4	38	4	16	2
2021	Commercial: 2.13% Mixed Use: 4.33%	62.76	55%	20%	3	26	4	10	1
2019	Commercial: 2.13% Mixed Use: 4.36%	145.95	65%	35%	4	38	4	16	2

Table 4-14: Survey table for the parameter Vitality and sub-parameter Activity. (Source: Author)

Parameter	VITALITY			
	Public Space			
Attributes	Quantitative		Qualitative	
	Formal Public space	**Informal Public Space**	**Type of Formal Public space**	**Type of Informal Public Space**
	in sq.m.	in sq.m.		
Case Study Area (B) - North-East Kolkata				
Site - BD Block Market (BD)				
Observation	14396	1304.7	Neighbourhood parks, Restaurants	Informal shops at market edge
Site - Diamond Plaza Mall (DP)				
Observation	131042	21353.4	Front porch of mall, Organised open parks , swimming pool.	Informal shops along the street, Temporary informal bazaar in morning and evening

Table 4-15: Survey table for the parameter Vitality and sub-parameter Public Space. (Source: Author)

The tables of observations showcasing the parameter **Liveability for both BD and DP** are given below.

Parameter	LIVEABILITY							
Sub-parameter	**Location**							
Variables	Quantitative		Qualitative					
	Size of Commercial Centre (sqm)	**Distance from City Centre (Km)**	**Routes-Area level**	**Routes- Area leveln (in numbers)**				**Layout**
				Major Arterial Road	Arterial Road	Sub Arterial Road	Collector road	
Case Study Area (B) - North-East Kolkata								
Site - BD Market (BD)								
Observation	3880.00	8.3	Located along Secondary Road - BD Block	0	0	1	3	Double storied U type Building
Site - Diamond Plaza (DP)								
Observation	30730	9.8	Located along Main Arterial Road - Jessore Road	0	1	0	1	6 storied rectangular box

Table 4-16: Survey table for the parameter Liveability and sub-parameter Location. (Source: Author)

Parameter	LIVEABILITY												
Sub-parameter	Accessibility												
Variables	Quantitative		Qualitative										
	Min. Distance of facilities from neighbourhoods	**Time taken to access**	**Routes- Site level (in numbers)**					**Mode of Travel (% number of the total vehicles)**					
	X (in metres)	Y(in minutes)	Major Arterial Road	Arterial Road	Sub Arterial Road	Collector road	Entry Points	Bus	MRTS	Auto	Cars	Bikes and bicycles	Pedestrian
Case Study Area (B) - North-East Kolkata													
Site - BD Market (BD)													
2022	750	7.50	0	0	1	3	4	0	0	10	25	15	50
2021			0	0	1	3	2	0	0	5	25	10	60
2019			0	0	1	3	4	0	0	10	25	15	50
Site - Diamond Plaza (DP)													
2022	350	3.50	0	1	0	1	6	15	0	15	30	10	30
2021			0	1	0	1	2	25	0	15	25	10	25
2019			0	1	0	1	6	25	0	15	20	10	30

Table 4-17: Survey table for the parameter Liveability and sub-parameter Accessibility. (Source: Author)

Parameter	LIVEABILITY						
Sub- parameter	Safety						
Variables	Quantitative			Qualitative			
	Natural Surveillance	**Mechanical Surveillance**		**Type of Pathway**		**Type of Lighting**	
	No of Active Frontages (nos.)	Patrol Booths (nos.)	CCTV Cameras (nos.)	Open (nos.)	Closed (nos.)	Halogen Streetlights (nos.)	LED Lights (nos.)
Case Study Area (B) - North-East Kolkata							
Site - BD Market (BD)							
Observation	3	0	3	4	0	9	15
Site - Diamond Plaza (DP)							
Observation	8	1	5	2	2	2	14

Table 4-18: Survey table for the parameter Liveability and sub-parameter Safety. (Source: Author)

The tables of observations showcasing the parameter **Sense of Place for both BD and DP** are given below.

Parameter	SENSE OF PLACE				
Sub- parameter	Urban Form				
Variables	Quantitative			Qualitative	
	Street Width	**Building Height**	**Building Front Offset**	**Edge**	**Shape**
	metres	metres	metres		
Case Study Area (B) - North-East Kolkata					
Site - BD Market (BD)					
	10	8	1	Defined	Square
Site - Diamond Plaza (DP)					
	20	20	5	Defined	Linear

Table 4-19: Survey table for the parameter Sense of Place and sub-parameter Urban Form. (Source: Author)

Parameter	SENSE OF PLACE						
Sub-parameter	Visibility						
Variables	Quantitative			Qualitative			
	Maximum Distance of Visibility (in metres)	**Height of visibility (in metres)**	**Angle of Visibility (in degrees)**	**Presence of Obstruction**			**Vista and Skyline**
				Trees (nos)	Placards (nos.)	% of façade under obstruction	
Case Study Area (B) - North-East Kolkata							
Site - BD Market (BD)							
	83	8 m	10	3	7	40%	Linear Vista
Site - Diamond Plaza (DP)							
	500	20	20	3	20	50%	Linear Vista

Table 4-20: Survey table for the parameter Sense of Place and sub-parameter Visibility. (Source: Author)

Parameter	SENSE OF PLACE							
Sub-parameter	Imageability							
Variables	Quantitative				Qualitative			
	No of Defined Edges (nos.)	**No. of nodes (nos.)**	**No. of pathways (nos.)**	**No. of Landmarks (nos.)**	**District**	**Edge**	**Landmark**	**Type of Node**
Case Study Area (B) - North-East Kolkata								
Site - BD Market (BD)								
	4	0	4	2	Residential	Defined	BD Park, UBI Bank ATM	Local node with informal food shops
Site - Diamond Plaza (DP)								
	2	0	1	5	Residential	partially defined	School, Housing complex and Raymond Shop	_

Table 4-21: Survey table for the parameter Sense of Place and sub-parameter Urban Form. (Source: Author)

4.5.2.3 Inferences:

The main inferences from **Case study area B** based on the three parameters of Vitality, Liveability and Sense of Place are as follows:

Vitality:

a. The Commercial area around BD is much lesser than DP and is also much more scattered. This makes BD much livelier than DP.

b. The public activity is linear and continuous in DP and disjoint and scattered in case of BD which renders DP as a livelier location.

c. BD market area has majorly residential function with fine grain and low height whereas DP has mixed use activity with a coarse grain. This makes DP more active as compared to BD.

d. BD market area has a single typology which are individual houses or gated housing colonies. DP has mixed typology with built to edge condition in many areas which facilitates creation of continuous commercial activity both formal and informal thus ensuring higher public activity.

e. BD has more formal public space and lesser informal public activity. DP has both formal public space and informal public activity. This makes DP a more active area than BD.

Liveability:

a. DP is located at the major arterial road whereas BD is located on the tertiary road within the neighbourhood. The tertiary connection renders BD less visible as compared to DP thus making the location of the latter more liveable than BD.

b. BD has more public entries as compared to DP making it more accessible to the public.

c. Both DP and BD are primarily accessed by private transport and walking which makes both accessible to all sections of the neighbourhood.

d. BD has more open public pathways making it safe and secure, but DP is open only on 2 sides restricting entrance possibilities.

e. DP has better lighting only on the road facing façade whereas BD id lit up on all directions which makes safer than DP.

Sense of Place:

a. The urban form of BD has defined edges with a planned square shape whereas the urban form of DP has undefined edges with a linear urban form. It is seen that the second kind of urban form has generated more commercial activity as compared to the first.

b. BD falls on along terminating vista but not at the end whereas DP falls on linear vista. In case of DP, the dominating skyline of the building makes it more visible as compared to BD which has a gradual vista.

c. The imageability aspect of commercial centres can be understood in terms of landmark, type of node and type of open space. In case of BD, it itself serves as a landmark along with BD Park and BD Memorial School. There is local node but it is more noticeable due to presence of prominent neighbourhood parks. DP is itself a landmark but the housing complex and school act as significant landmarks. There is no node or significant public open space around this area open space. This makes the visibility of BD market greater than that of DP which in turn increases the sense of place of BD than DP.

4.5.3 Case Study Area C: South-West Kolkata

4.5.3.1 Selection

4.5.3.1.1 Park Circus Market, Park Circus

a. Description

Figure 4-20 : Exterior view of Park Circus market. (Source: Author)

Park Circus is one of the oldest markets in South Kolkata. It was one of the Municipal markets in South Kolkata. It serves as one of the central markets for this part if the city. It is located around varied urban fabric. It is at the juncture of the White town and the Black Town. Thus it is surrounded by residential neighbourhoods of both colonial and vernacular in nature. The Quest Mall is located in the within 300 m of the market. Presence of the market has generated commercial activities around this area.

b. Delineation

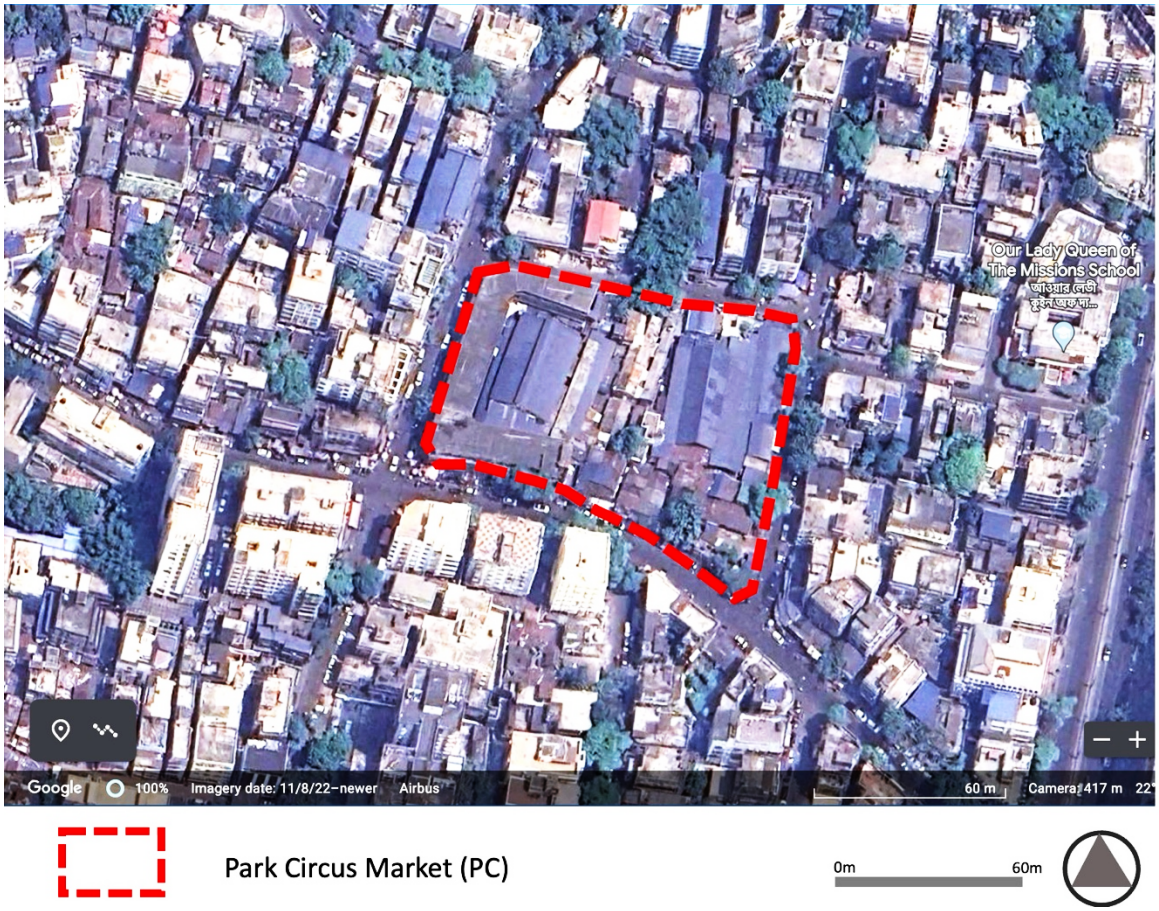


Figure 4-21: Satellite image of Park Circus Market (PC). (Source : Google Maps)

The market is located in the Beck Bagan area along the Beck Bagan Row. It can be accessed by two arterial roads Syed Amir Ali Avenue and Circus Avenue. To the north there is the road leads to Park Circus five-point crossing, to the South the Syed Amir Ali Avenue leads to Gariahat. To the West the Roads lead to Minto Park and to the east is Quest Mall.

The following map shows the immediate influence area of the market within walking distance (500 m). Subsequently a map for building use has been generated to see the functional distribution that has occurred or is being influenced by this market.

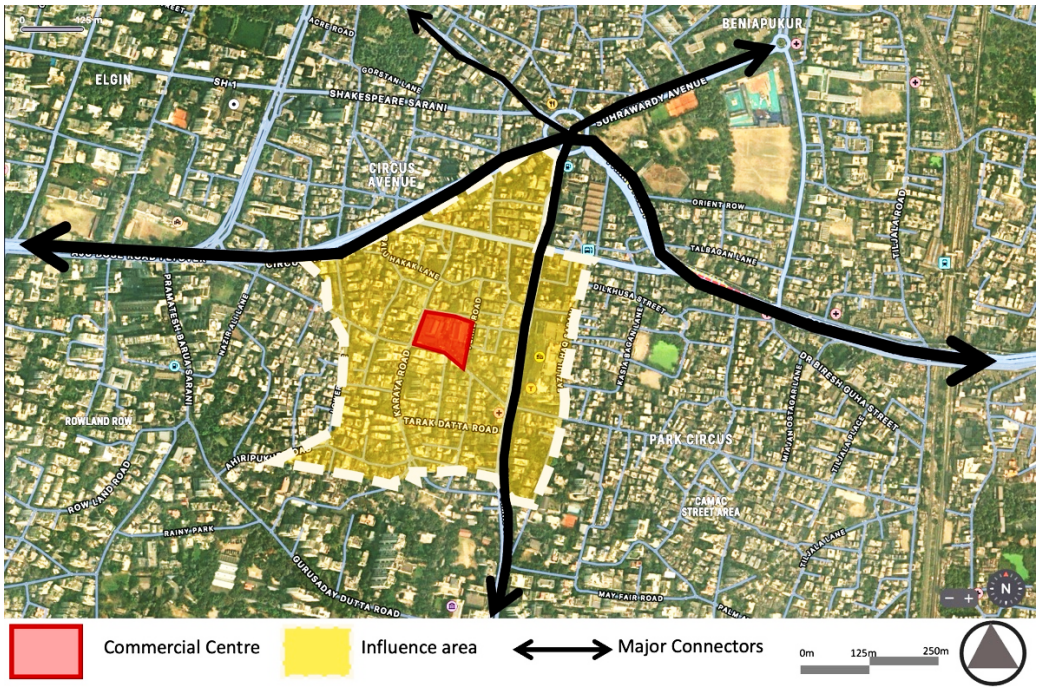


Figure 4-22 : Satellite Image of Park Circus Market (PC) and its immediate influence area. (Source:Generated through Apple maps.)

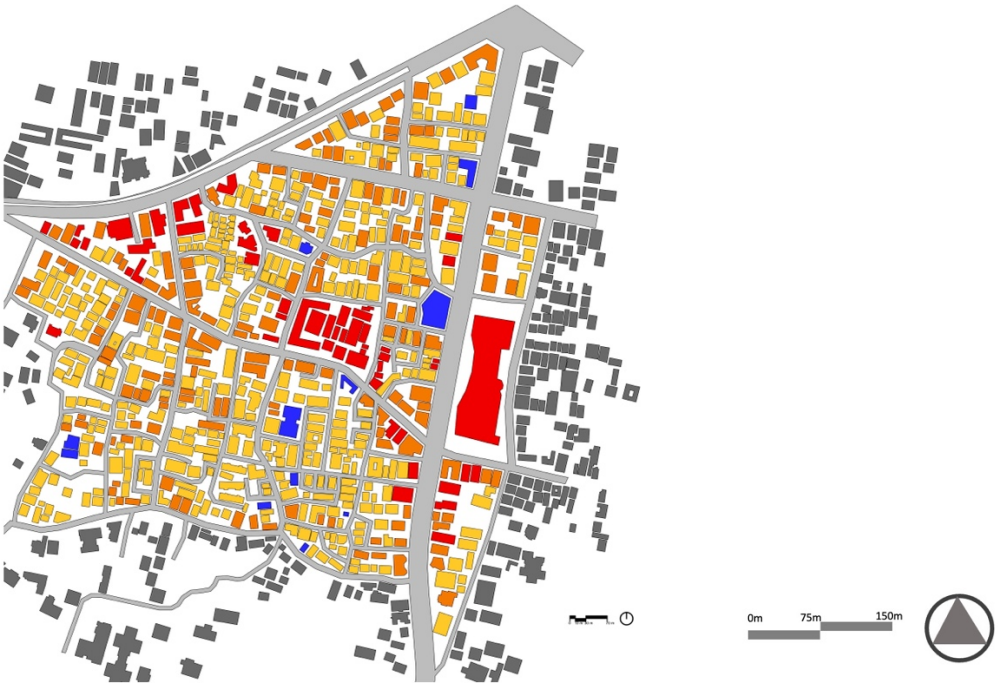


Figure 4-23: Building use distribution of area around Park Circus market. (Source : Author)

Building use type	***Residential***	***Mixed Use***	***Commercial***	***Institutional***	***Industrial***	***Others***
% Land area covered	*41*	*7.21*	*4.32*	*2.07*	*_*	*45.4*

Table 4-22: Building use distribution of area around Park Circus Market (PC). (Source : Author)

4.5.3.1.2 Lake Mall, Rashbehari.

a. Description

Figure 4-24: Exterior view of Lake Mall (LM).(Source Author)

Lake Mall is one of the most unique malls in the city. The mall is a part of a major redevelopment project for the original Lake Market. The lake market was one of the oldest markets in South Kolkata. It was the hub of fresh produce and goods. This along with the textile market along Rashbehari Road was a successful commercial centre. The condition of the traditional market was deteriorating. This led to a long difficult process over almost 10 years which led to finally building of a novel Mall retaining the traditional market at the ground floor and the rest of the mall on the upper floors. On August 14,2013 Lake Mall and e-Kolkata citizen service centre was inaugurated at Rash Behari Avenue. It is a Private-Public Partnership (PPP) model project between KMC and Venkatesh Foundation.

b. Delineation

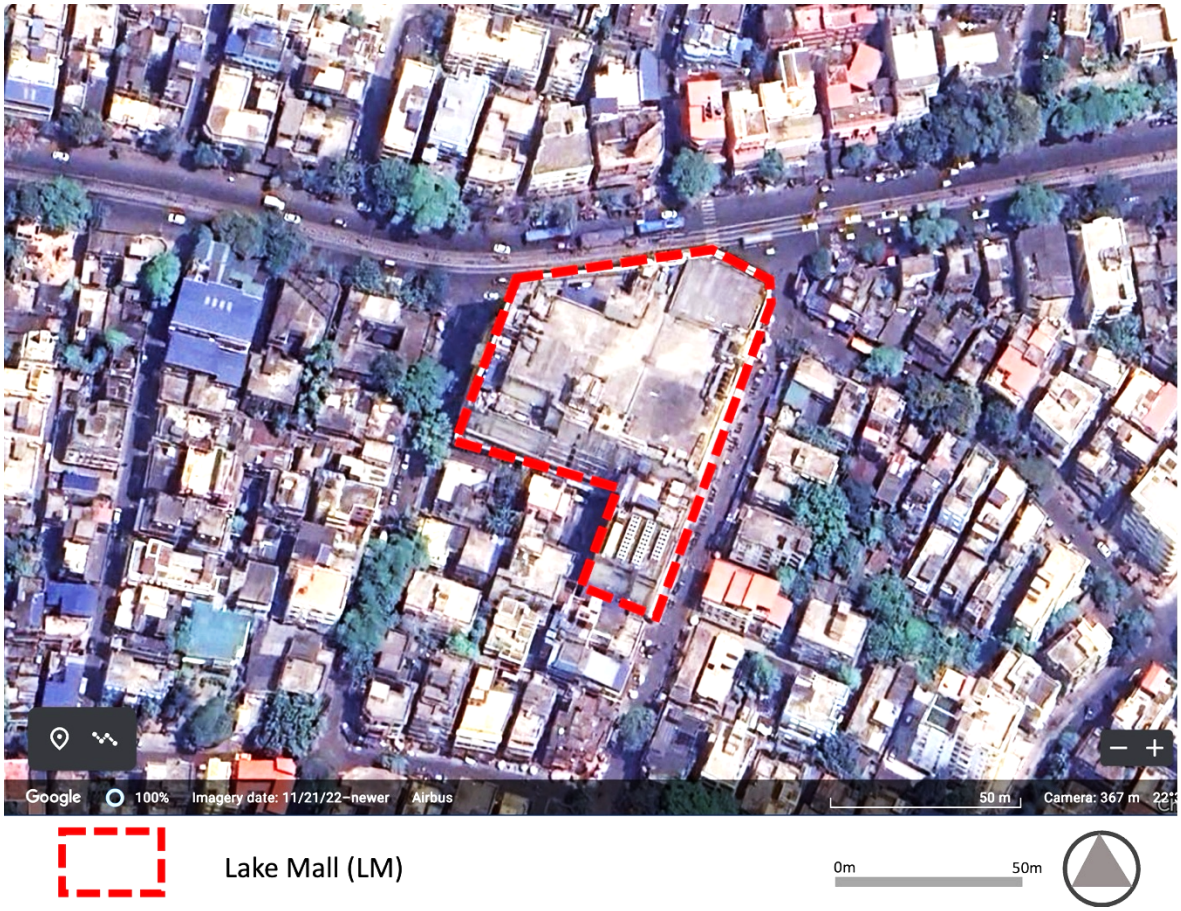


Figure 4-25 : Satellite image of Lake Mall (LM).(Source : Google Maps)

Lake Mall is located along the Rashbehari Avenue at the juncture where it meets Kavi Bharati Sarani. It is surrounded by residential areas around Ballygaunge Lake, Kalighat and Hazra.

The following map shows the immediate influence area of the shopping mall within walking distance (500 m). Subsequently a map for building use has been generated to see the functional distribution that has occurred or is being influenced by this mall.

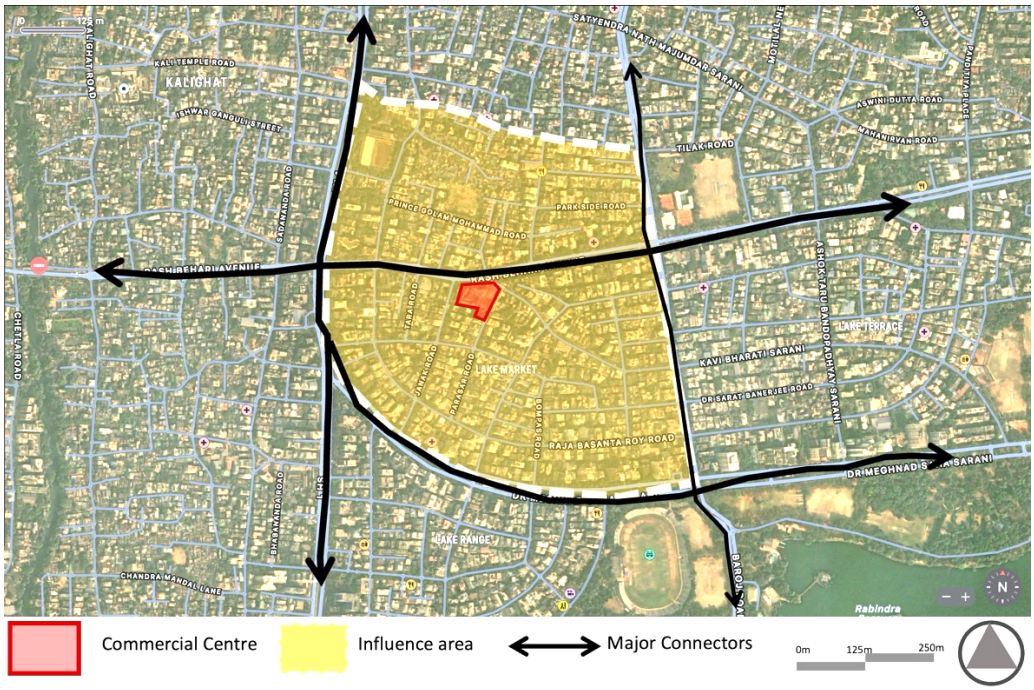


Figure 4-26: Satellite Image of Lake Mall (LM) and its immediate influence area. (Source: Generated through Apple maps.)

Figure 4-27: Building Use Distribution around Lake Mall. Source: Author

Building use type	***Residential***	***Mixed Use***	***Commercial***	***Institutional***	***Industrial***	***Others***
% Land area covered	*40.76*	*6.72*	*4.2*	*1.50*	*–*	*46.82*

Table 4-23: Building use distribution of area around Lake Mall (LM). (Source : Author)

4.5.3.2 Study & Analysis

The markets in **Case Study Area C** have been studied based on the parameters chalked out in Chapter 3. The table of observations for the same has been studied based on the major three parameters – Vitality, Livability and Sense of Place.

The tables of observations showcasing the parameter **Vitality for both PC and LM** are given below.

Parameter	VITALITY								
Sub-parameter	Activity								
Variables	Quantitative		Qualitative						
	Built Use (In %)	**Pedestrian Flow**	**Nature of Commercial Activity (In %)**		**Product Mix (in numbers)**				
		people/minute	Formal	Informal	Groceries and Household	Garments & Lifestyle	Medicine shops	Food	Entertainment
Case Study Area (C) - South-West Kolkata									
Site - Park Circus Market (PC)									
2022	Commercial: 4.35% Mixed Use: 7.30%	102.17	60%	40%	168	57	11	15	0
2021	Commercial: 4.32% Mixed Use: 7.00%	45.92	55%	23%	100	41	9	10	0
2019	Commercial: 4.32% Mixed Use: 7.21%	114.8	60%	40%	168	60	7	13	0
Site - Lake Mall (LM)									
2022	Commercial: 4.21% Mixed Use: 6.79%	169.71	70%	30%	4	42	9	12	2
2021	Commercial: 4.2% Mixed Use: 6.72%	91.38	65%	12%	3	21	8	7	1
2019	Commercial: 4.2% Mixed Use: 6.72%	217.58	80%	20%	4	40	6	15	2

Table 4-24: Survey table for the parameter Vitality and sub-parameter Activity. (Source: Author) Images source: Author

Parameter	**VITALITY**			
Sub-parameter	**Public Space**			
Variables	Quantitative		Qualitative	
	Formal Public space	**Informal Public Space**	**Type of Formal Public space**	**Type of Informal Public Space**
	in sq.m.	in sq.m.		
Case Study Area (C) - South-West Kolkata				
Site - Park Circus Market (PC)				
Observation	100976.5	20614.8	Formal retail shops, Parks.	Informal street shopping, Undefined open spaces between bldgs.
Site - Lake Mall (LM)				
Observation	16041.4	16023.45	Parks, Retail shops, Metro Stations	Informal shopping, footpaths, Kiosks around parks.

Table 4-25: Survey table for the parameter Vitality and sub-parameter of Public Space. (Source: Author)

The tables of observations showcasing the parameter **Liveability for both PC and LM** are given below.

Parameter	**LIVEABILITY**							
Sub-parameter	**Location**							
Variables	Quantitative		Qualitative					
	Size of Commercial Centre (sqm)	**Distance from City Centre (Km)**	**Routes-Area level**	**Routes- Area level**				**Layout**
				Major Arterial Road	Arterial Road	Sub Arterial Road	Collector road	
Case Study Area (C) - South-West Kolkata								
Site - Park Circus Market (PC)								
Observation	14141.89	7.2	Secondary road – Beck began Row	0	0	1	3	2 storied U type Building
Site - Lake Mall (LM)								
Observation	26700	8.8	Primary Road – Rashbehari Avenue	0	1	0	3	7 storied rectangular bldg., GF-Market, other floor - Mall

Table 4-26: Survey table for the parameter Liveability and sub-parameter Location. (Source: Author

Parameter	LIVEABILITY												
Sub-parameter	Accessibility												
Variables	Quantitative		Qualitative										
	Min. Distance of facilities from neighbourhoods	**Time taken to access**	**Routes- Site level (in numbers)**					**Mode of Travel (% number of total vehicles)**					
	X (in metres)	Y (in mins)	Major Arterial Road	Arterial Road	Sub Arterial Road	Collector road	Entry Points	Bus	MRTS	Auto	Car	Bikes and bicycle	Pedestrian
Case Study Area (C) - South-West Kolkata													
Site - Park Circus Market (PC)													
2022	300	3.50	0	0	1	3	5	5	0	5	15	30	45
2021			0	0	1	3	3	5	0	10	13	27	45
2019			0	0	1	3	5	5	0	10	10	25	50
Site - Lake Mall (LM)													
2022	550	7.50	0	1	0	3	3	10	5	20	35	10	25
2021			0	1	0	3	2	15	5	20	30	10	30
2019			0	1	0	3	3	20	5	20	25	10	25

Table 4-27: Survey table for the parameter Liveability and sub-parameter Accessibility. (Source: Author)

Parameter	LIVEABILITY						
Sub-parameter	Safety						
Variables	Quantitative			Qualitative			
	Natural Surveillance	**Mechanical Surveillance**		**Type of Pathway**		**Type of Lighting**	
	No of Active Frontages (nos.)	Patrol Booths (nos.)	CCTV Cameras (nos.)	Open (nos.)	Closed (nos.)	Halogen Streetlights (nos.)	LED Lights (nos.)
Case Study Area (C) - South-East Kolkata							
Site - Park Circus Market (PC)							
Observation	15	1	2	4	0	12	32
Site - Lake Mall (LM)							
Observation	12	1	5	4	0	8	32

Table 4-28: Survey table for the parameter Liveability and sub-parameter Safety. (Source: Author)

The tables of observations showcasing the parameter **Sense of Place for both PC and LM** are given below.

Parameter	SENSE OF PLACE				
Sub-parameter	Urban Form				
Variables	Quantitative			Qualitative	
	Street Width	**Building Height**	**Building Front Offset**	**Edge**	**Shape**
	metres	metres	metres		
Case Study Area (C) - South-East Kolkata					
Site - Park Circus Market (PC)					
	12	8	0	Physically Permeable and overlapping	Rectangular
Site - Lake Mall (LM)					
	25	32	0	Physically Permeable	Linear

Table 4-29: Survey table for the parameter Sense of Place and sub-parameter Urban Form. (Source: Author)

Parameter	SENSE OF PLACE						
Sub-parameter	Visibility						
Variables	Quantitative			Qualitative			
	Maximum Distance of Visibility (in metres)	**Height of visibility (in metres)**	**Angle of Visibility (in degrees)**	**Presence of Obstruction**			**Vista and Skyline**
				Trees (nos.)	Placards (nos.)	% of façade under obstruction	
Case Study Area (C) - South-East Kolkata							
Site - Park Circus Market (PC)							
	158	8 m	20	4	8	30%	Linear Vista
Site - Lake Mall (LM)							
	623	32	20	4	9	35%	Terminating Vista

Table 4-30: Survey table for the parameter Sense of Place and sub-parameter Visibility. (Source: Author)

Parameter	SENSE OF PLACE							
Sub-parameter	Imageability							
Variables	Quantitative				Qualitative			
	No of Defined Edges (nos.)	**No. of nodes** (nos.)	**No. of pathways** (nos.)	**No. of Landmarks** (nos.)	**District**	**Edge**	**Landmark**	**Type of Node**
Case Study Area (C) - South-East Kolkata								
Site - Park Circus Market (PC)								
	1	2	5	3	Commercial	partially defined	Hospital, Vintage restaurants, Hotel, Police Station, Mosque	Local
Site - Lake Mall (LM)								
	1	1	3	1	Commercial	partially defined	Metro station	City Level

Table 4-31: Survey table for the parameter Sense of Place and sub-parameter Imageability. (Source: Author)

4.5.3.3 Inferences

The main inferences from **Case study area C** based on the three parameters of Vitality, Liveability and Sense of Place are as follows:

Vitality:

a. Both PC and LM are located at prime locations in South Kolkata with the presence of city level traditional markets and commercial activity around the area.

b. Both have fine grain and uneven texture of urban form surrounding them. But the building typology around LM is less dense than that of PC making PC accessible for residents as compared to LM.

c. The colonial and vernacular typology supports built-to-edge conditions which help in supporting continuous commercial and public activities to both formal and informal in nature.

d. There is presence of both formal and informal public space in both cases but LM is located at a continuous commercial stretch of arterial road along the Rashbehari Avenue making it more vital as a public space.

Liveability:

a. Even though PC is located at a secondary road this acts as a bypass for traffic between 2 arterial roads. This makes the location prominent and accessible. LM is located on the major arterial road with a higher building height making it more visible and understandable due to its locational advantage.

b. In case of accessibility, both the markets have bazaar as a component making multiple entire possible making them both universally accessible as marketplace increasing public realm and activity.

c. Both are accessible to the immediate neighbourhood by walking primarily. Both are centres for commercial activity for ease of access.

d. Formal surveillance is more in case of LM as compared to PC. In case of natural surveillance both have active pathways on all sides but in case of PC, the night-time activity is limited which makes it less safe than LM.

Sense of Place:

a. Both edge types are permeable and overlapping in nature. But the urban form of LM is linear and PC is rectangular in shape.

b. The skyline for LM is more prominent because of the building height which makes it clearly visible from all directions.

c. LM itself is a landmark along with other significant landmarks around the area. The active frontages of PC make it a landmark. LM has a city level node and defined city level urban spaces.

4.5.4 Case Study Area D: South-East Kolkata

4.5.4.1 Selection

4.5.4.1.1 Rashmoni Bazar, Beliaghata.

a. Description

Figure 4-28 : Exterior view of Rashmoni Bazaar(RB).(Source Author)

Rashmoni Bazar in a market located on the outskirts of the CIT area in Belieghata, This market represents the traditional market typology of the city. It is composed of informal and formal shops. The shops are essentially slabs for raw perishable items and closed shops for groceries and non-perishable items. The surrounding areas of the market are lined with periodic informal shops. This is the go-to marketplace for the entire area along the Beliaghata canal. There has been no plan of redevelopment of this market.

b. Delineation

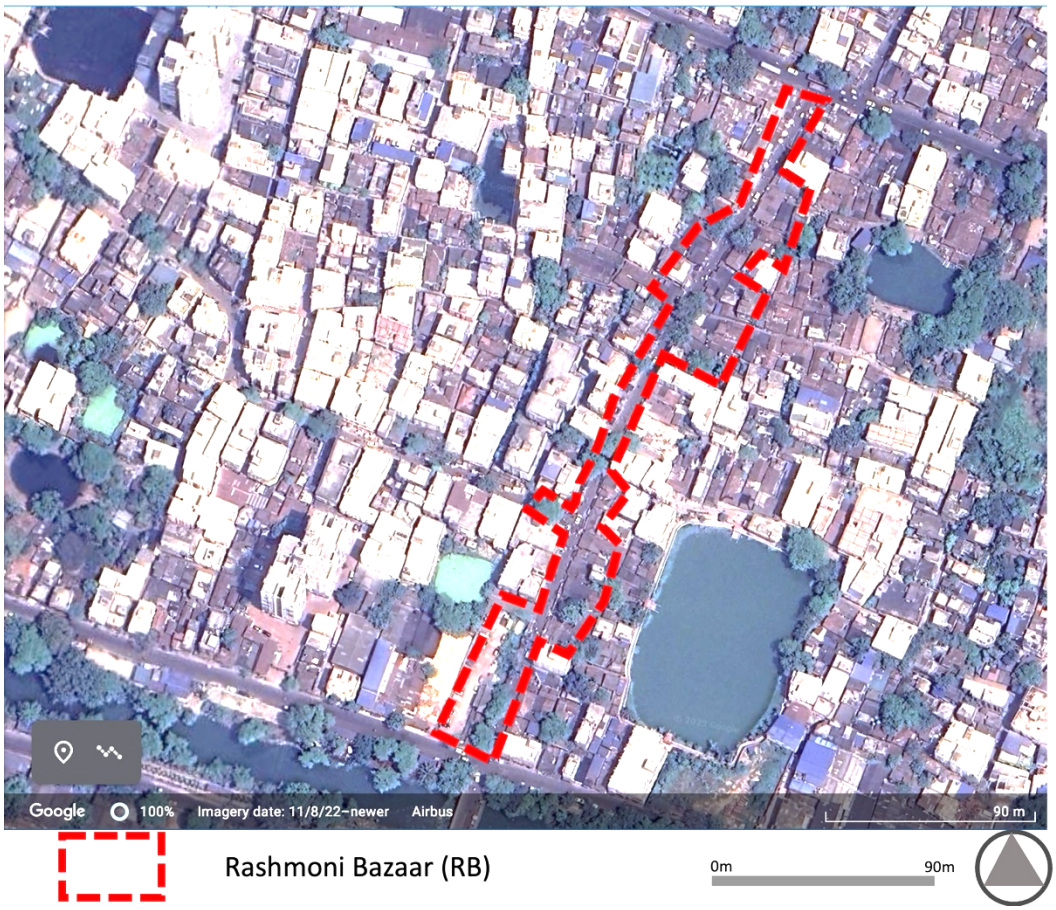


Figure 4-29 : Satellite image of Rashmoni Bazaar(RB). (Source : Google Maps)

Located within the neighbourhoods of Beliaghata along Beliaghata Main Road. This market is connected to the eastern peripheral parts of the city. The eastern Metropolitan bypass can also be an access for the marketplace.

The following map shows the immediate influence area of the market within walking distance (500 m). Subsequently a map for building use has been generated to see the functional distribution that has occurred or is being influenced by this market.

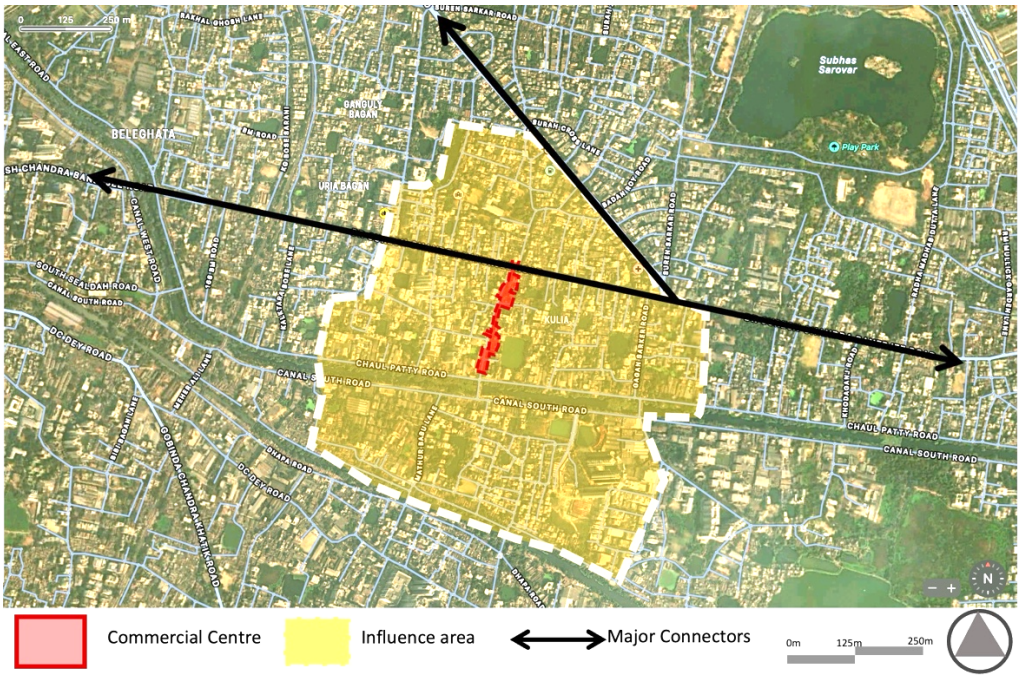


Figure 4-30 : Satellite Image of Rashmoni Bazaar (RB) and its immediate influence area.(Source: Generated through Apple maps.)

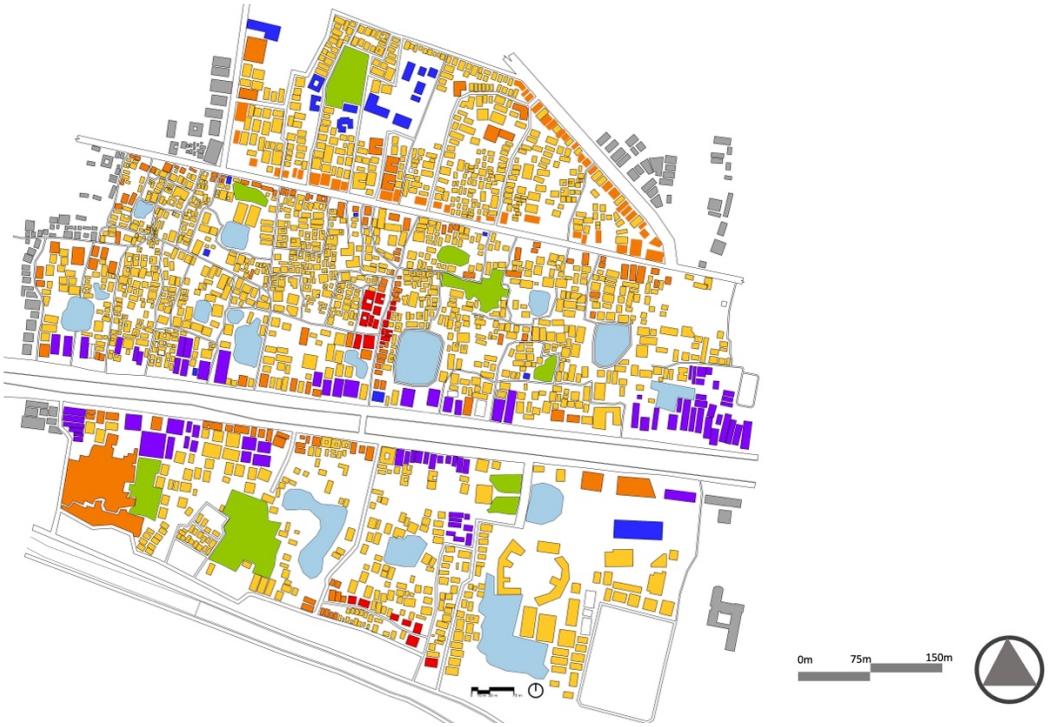


Figure 4-31 : Building Use Distribution around Rashmoni bazaar. (RB)(Source: Author)

Building use type	***Residential***	***Mixed Use***	***Commercial***	***Institutional***	***Industrial***	***Others***
% Land area covered	***35.98***	***4.85***	***0.83***	***1.04***	***6.1***	***51.2***

Table 4-32: Building use distribution of area around Rashmoni Bazaar (RB). (Source : Author)

4.5.4.1.2 Acropolis Mall, Kasba

a. Description

Figure 4-32 : Exterior view of Acropolis mall (AM).(Source Author)

Acropolis mall, henceforth referred to as AM, is located in Ruby Park, Kasba area of Kolkata. As a more recently developed city extension the Mall exudes a very different ambience as compared to all other commercial centres. It is part of a commercial project by Merlin Group which comprises of the shopping mall and commercial office area. It is a high-rise building of 22 floors with the lower 5 floors composing the mall.

b. Delineation

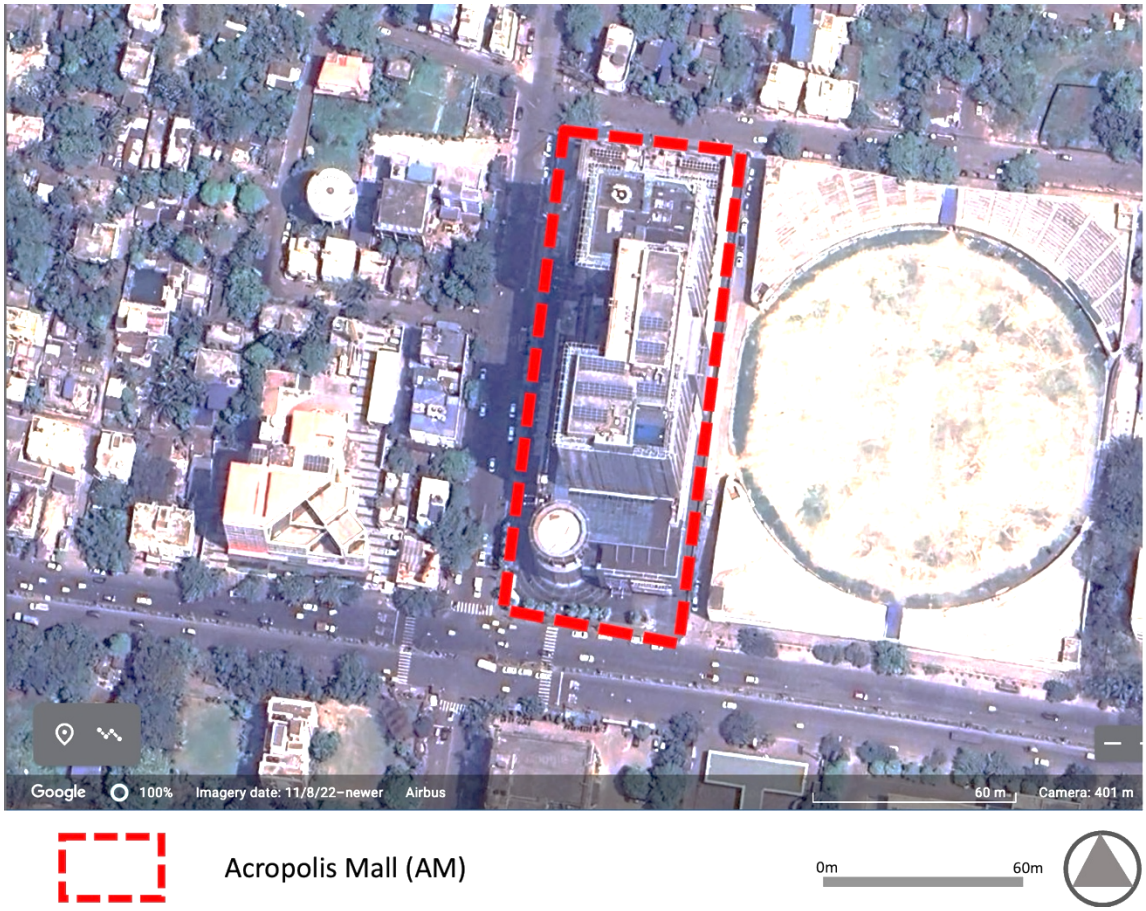


Figure 4-33: Satellite Image of Acropolis mall (AM). (Source : Google Maps)

The mall is located along the Rashbehari Avenue connector. The area is surrounded by commercial, institutional, and residential areas. This is a relatively new area of the city which has more high rises and bigger footprints. The residential buildings are primarily of the apartment.

The following map shows the immediate influence area of the shopping mall within walking distance (500 m). Subsequently a map for building use has been generated to see the functional distribution that has occurred or is being influenced by this mall.

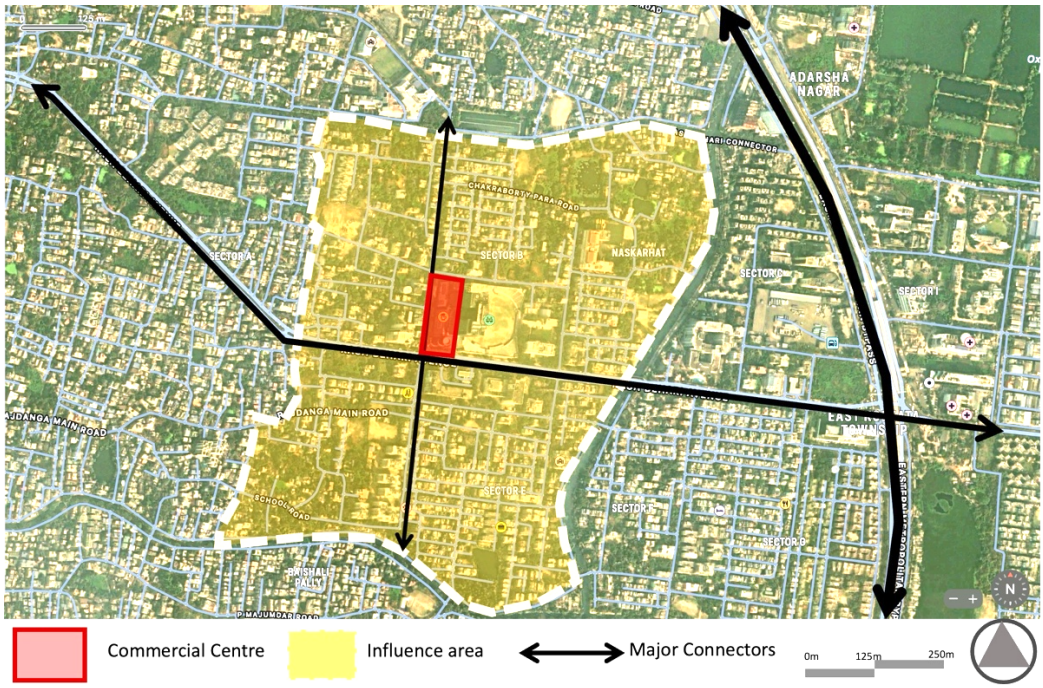


Figure 4-34: Satellite Image of Acropolis Mall (AM) and its immediate influence area. (Source: Generated through Apple maps).

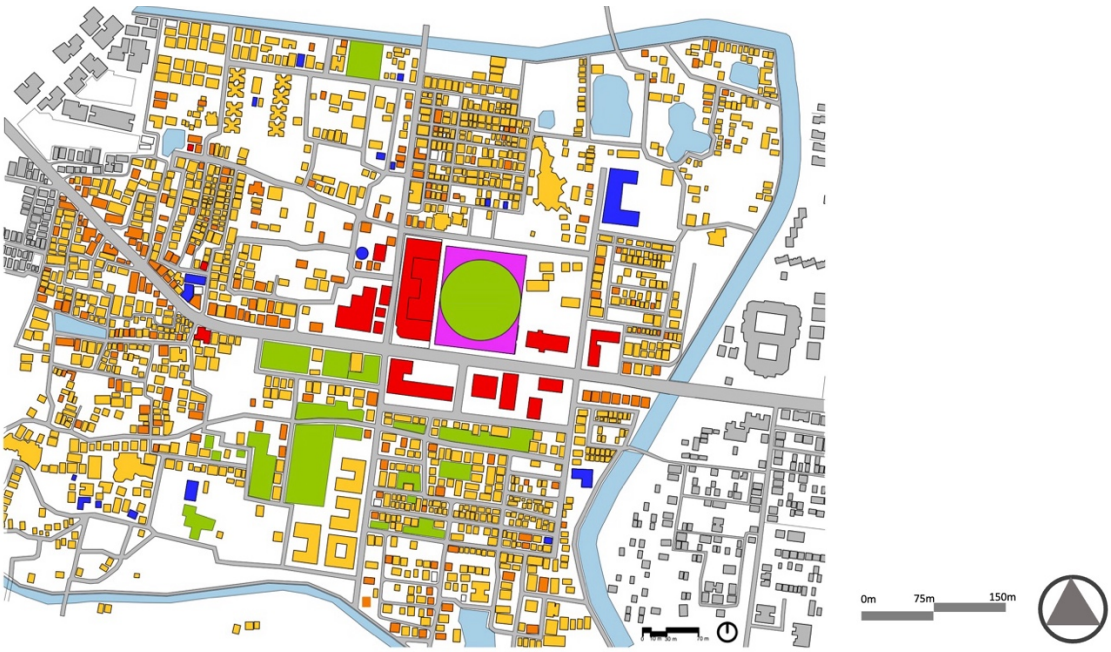


Figure 4-35: Building Use Distribution around Acropolis Mall.(Source: Author)

Building use type	***Residential***	***Mixed Use***	***Commercial***	***Institutional***	***Recreational***	***Others***
% Land area covered	***31.65***	***3.23***	***2.63***	***1.45***	***0.37***	***60.67***

Table 4-33: Building use distribution of area around Rashmoni Bazaar (RB). (Source : Author)

4.5.4.2 Study & Analysis

The markets in **Case Study Area D** have been studied based on the parameters chalked out in Chapter 3. The table of observations for the same has been surveyed based on the major three parameters – Vitality, Livability and Sense of Place.

The tables of observations showcasing the parameter **Vitality for both RB and AM** are given below.

Parameter Sub-parameter	**VITALITY**								
	Activity								
Variables	Quantitative		Qualitative						
	Built Use (In %)	**Pedestrian Flow**	**Nature of Commercial Activity (In %)**		**Product Mix (in numbers)**				
		people/minute	Formal	Informal	Groceries and Household	Garments & Lifestyle	Medicine shops	Food	Entertainment
Case Study Area (D) - South-East Kolkata									
Site - Rashmoni Bazaar (RB)									
2022	Commercial: 0.83% Mixed Use: 4.85%	93.17	64%	36%	82	9	5	5	0
2021	Commercial: 0.62% Mixed Use: 4.82%	63.57	57%	19%	54	7	5	5	0
2019	Commercial: 0.83% Mixed Use: 4.82%	109.61	63%	37%	82	7	5	5	0
Site - Acropolis Mall (AM)									
2022	Commercial: 2.63% Mixed Use: 3.23%	135.19	80%	20%	2	35	5	17	2
2021	Commercial: 2.6% Mixed Use: 3.00%	73.39	61%	14%	2	21	5	13	1
2019	Commercial: 2.6% Mixed Use: 3.00%	193.13	76%	24%	2	35	5	15	2

Table 4-34: Survey table for the parameter Vitality and sub-parameter Activity. (Source: Author)

Parameter	**VITALITY**			
Sub-parameter	**Public Space**			
Variables	Quantitative		Qualitative	
	Formal Public space	**Informal Public Space**	**Type of Formal Public space**	**Type of Informal Public Space**
	in sq.m.	in sq.m.		
Case Study Area (D) - South-East Kolkata				
Site - Rashmoni Bazaar (RB)				
Observation	15344.7	3830.93	Private gardens, Neighbourhood ponds, Community marriage halls	Informal shopping, undefined open spaces
Site - Acropolis Mall (AM)				
Observation	29231.1	10029.6	Parks, Retail shops.	Informal shopping, undefined open spaces

Table 4-35: Survey table for the parameter Vitality and sub-parameter Public Space. (Source: Author)
Images source: Author

The tables of observations showcasing the parameter **Liveability for both RB and AM** are as follows:

Parameter	**LIVEABILITY**							
Sub-parameter	**Location**							
Variables	Quantitative		Qualitative					
	Size of Commercial Centre (sqm)	**Distance from City Centre (Km)**	**Routes- Area level**	**Routes- Area level (in numbers)**				**Layout**
				Major Arterial Road	Arterial Road	Sub Arterial Road	Collector road	
Case Study Area (D) - South-West Kolkata								
Site - Rashmoni Bazar (RB)								
Observation	3589.3	5.4	Connected to tertiary road	0	0	1	3	One storey Informal
Site - Acropolis Mall (AM)								
Observation	58064.4	13.8	Connected to Primary road- Rashbehari Connector	0	1	1	1	20 storeyed rectangular box, 5 floors mall, rest are offices

Table 4-36: Survey table for the parameter Liveability and sub-parameter Location. (Source: Author)

Parameter	**LIVEABILITY**											
Sub-parameter	**Accessibility**											
Variables	Quantitative		Qualitative									
	Min. Distance of facilities from neighbourhoods	**Time taken to access**	**Routes- Site level (in numbers)**					**Mode of Travel (% number of total vehicles)**				
	X (im metres)	Y(in minutes)	Major Arterial Road	Arterial Road	Sub Arterial Road	Collector road	Entry Points	Bus	MRTS	Auto	Cars	Bikes and bicycles	Pedestrian
Case Study Area (D) - South-West Kolkata													
Site - Rashmoni Bazar (RB)													
2022	300	7.50	0	0	1	3	6	5	0	10	5	20	60
2021			0	0	1	3	2	5	0	10	10	15	60
2019			0	0	1	3	6	5	0	15	5	15	60
Site - Acropolis Mall (AM)													
2022	850	12.50	0	1	1	1	4	20	0	20	35	5	20
2021			0	1	1	1	2	20	0	20	35	5	20
2019			0	1	1	1	4	25	0	20	30	5	20

Table 4-37: Survey table for the parameter Liveability and sub-parameter Accessibility. (Source: Author)

Parameter	**LIVEABILITY**						
Sub-parameter	**Safety**						
Variables	Quantitative			Qualitative			
	Natural Surveillance	**Mechanical Surveillance**		**Type of Pathway**		**Type of Lighting**	
	No of Active Frontages (Nos.)	Patrol Booths (Nos.)	CCTV Cameras (Nos.)	Open(Nos.)	Closed(Nos.)	Halogen Streetlights(Nos.)	LED Lights(Nos.)
Case Study Area (D) - South-West Kolkata							
Site - Rashmoni Bazar (RB)							
Observation	19	0	3	4	0	17	36
Site - Acropolis Mall (AM)							
Observation	6	2	10	3	1	4	15

Table 4-38: Survey table for the parameter Liveability and sub-parameter Safety. (Source: Author)

The tables of observations showcasing the parameter **Sense of Place for both RB and AM** are as follows:

Parameter	SENSE OF PLACE				
Sub-parameter	**Urban Form**				
Variables	Quantitative			Qualitative	
	Street Width	**Building Height**	**Building Front Offset**	**Edge**	**Shape**
	metres	metres	metres		
Case Study Area (D) - South-West Kolkata					
Site - Rashmoni Bazar (RB)					
	10	6	0	Undefined , overlapping	Linear
Site - Acropolis Mall (AM)					
	25	110	6	Defined	Rectangular

Table 4-39: Survey table for the parameter Sense of Place and sub-parameter Urban Form. (Source: Author)

Parameter	SENSE OF PLACE						
Sub-parameter	**Visibility**						
Variables	Quantitative			Qualitative			
	Maximum Distance of Visibility (metres)	**Height of visibility (metres)**	**Angle of Visibility (degrees)**	**Presence of Obstruction**			**Vista and Skyline**
				Trees (nos.)	Placards (nos.)	% of façade under obstruction	
Case Study Area (D) - South-West Kolkata							
Site - Rashmoni Bazar (RB)							
	20	6	7	7	18	35%	Linear Vista
Site - Acropolis Mall (AM)							
	885	110	15	3	15	30%	Terminating Vista

Table 4-40: Survey table for the parameter Sense of Place and sub-parameter Visibility. (Source: Author)

Parameter	SENSE OF PLACE							
Sub-parameter	**Imageability**							
Variables	Quantitative				Qualitative			
	No of Defined Edges (Nos.)	**No. of nodes** (Nos.)	**No. of pathways** (Nos.)	**No. of Landmarks** (Nos.)	**District**	**Edge**	**Landmark**	**Type of Node**
Case Study Area (D) - South-West Kolkata								
Site - Rashmoni Bazar (RB)								
	0	1	6	4	Residential	Undefined	Temple, Clinic School	Neighbourhood Node
Site - Acropolis Mall (AM)								
	4	1	2	6	Commercial	Defined	Commercial buildings, School	Secondary node

Table 4-41: Survey table for the parameter Sense of Place and sub-parameter Imageability.. (Source: Author)

4.5.4.3 Inferences:

The main inferences from Case study area D based on the three parameters of Vitality are as follows.

Vitality:

a. The type of activity around RB is primarily residential like AM. The commercial activity is lesser than AM which makes AM a lively location.

b. Both areas have space for public activity but the areas around AM have more city level public activity whereas RB has local level public activity. Thus, AM is attracting people from all over the city as compared to RB.

c. The fine grain and even pattern supports more commercial activity than the coarse grain uneven pattern does not support continuous commercial activity making AM less public than RB.

d. The typology of RB is colonial and vernacular and is denser than the modern built forms of AM which makes RB accessible to greater number of people.

e. The type of publicness of the adjoining open spaces are same for both RB and AM.

Liveability:

a. RB is connected to a tertiary road whereas AM is located on a primary road making the location of AM more prominent than RB.

b. The layout of RB is more suited for neighbourhood commercial as compared to AM.

c. At the site level, RB is better connected to the neighbourhood as compared to AM.

d. RB is accessed locally especially by walking and 2 wheelers bur AM is primarily accessed by private transport, autos and busses. Thus, RB is popular locally compared to AM.

e. There is more natural surveillance in RB due to proximity of residential buildings and informal commercial as compared to AM.

f. The lighting conditions of AM is better than RB making it safer than AM.

Sense of Place:

a. The urban form of RB has undefined overlapping edge with linear shape whereas AM has defined edges and rectangular form making AM more prominent than RB.

b. The visibility of AM is better due to its higher height in the skyline as compared to RB which merges with the surroundings.

c. AM itself acts as a landmark with its significant building form and location compared to RB. Along with these there are other significant public buildings in proximity of AM compared to RB increasing its imageability.

d. AM is located at a prominent secondary node on an arterial node whereas RB is not located at any node making AM more imageable.

e. AM has a city level open space next to it whereas there are no open spaces immediately around RB making it less attractive to the public than AM.

5.0 DISCUSSION AND INTERPRETATION OF RESULTS

5.1 Background

The following section is focussed on analysis of the on-site data and look towards finding the current trends of development. The sub-parameters and variables derived in Chapter 03 was evaluated with the help of the data collected in Chapter 04 to determine the dependent and independent variables which influence each of the sub-parameters which in turn are the most relevant for the parameters. The research design followed for the same is as follows:

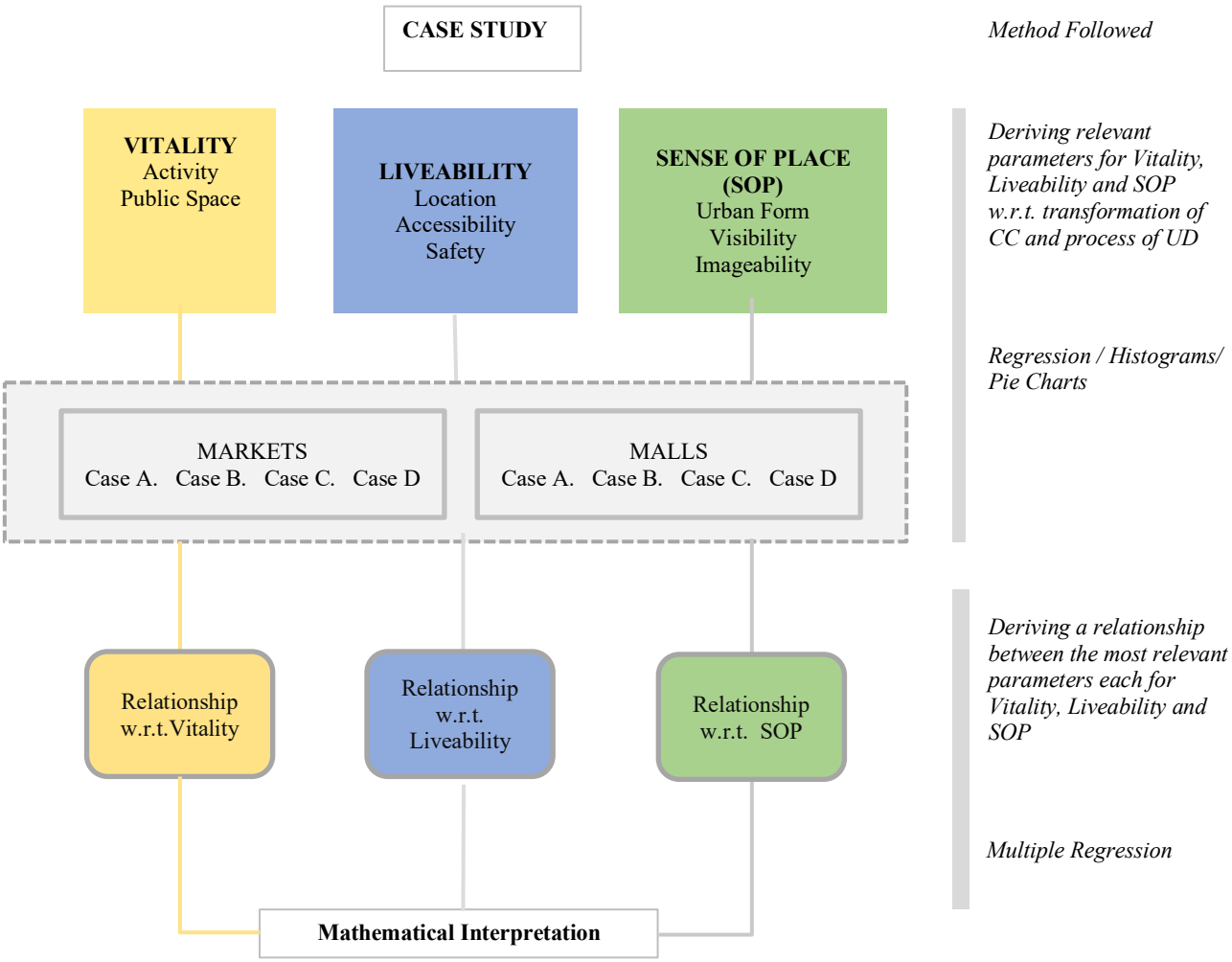


Figure 5-1: Research Design 2 showing the methodology followed for deriving relationships with respect to Vitality , Liveability and Sense of Place. (Source: Author)

5.2 Methods Used

Various studies of urban transformation make use of Multivariate Analysis as a tool to determine and predict the degree of change in the urban context. Regression analysis is one of the common methods of determining rates of transformation. Data sets have been analysed by use of R-squared values to determine rate of transformation in various urban studies. Some examples such are seen in determination of transformation of natural land use land cover (LULC) to the built-up areas (Naikoo, 2022), changes in city block sizes and their effect on vitality (Long, 2019), determination of relation between urban vitality and street centrality (Yue & Zhu, 2019), determination of liveability in Dutch Cities (Lavering, 2023), and exact fit test to determine liveability and happiness across 5 cities (Goldberg, 2012).

Following the above examples, path to establishing a relationship to determine transformation of CC can be determined to be two-fold. The steps followed for the same are:

1. Firstly, it is mandatory to understand which sub-parameters are highly susceptible to transformation with respect to each parameter. The observational data seen in case studies are used to determine the same. For the purpose of determination of the most relevant sub-parameter with respect to the parameter (Vitality, Livability or Sense of Place), the methods to determine dependent and independent variables have been used like simple linear regression and co-relation matrix mathematically. Other variables have been represented visually with the help of bar charts and pie charts to show the comparisons between the different cases of markets and malls.

2. Secondly, the variables influencing the most relevant sub-parameter are analysed to determine the dependent and independent variables and a relationship between them. The relationship determines the change that occurs directly on the dependent variable which becomes the primary contributing factor for influencing transformation with respect to the most relevant sub-parameter. This eventually drives the transformation parameters of either Vitality, Liveability and Sense of Place.

Due to the presence of multiple sub-parameters and variables, methods of Multivariate Analysis (MVA) have been taken into consideration. Multivariate analysis is part of Exploratory data analysis. Multivariate analysis (MVA) is a Statistical approach taken for analysing multiple observational data related to more than one type of measurement. It is a method for elucidating problems where dependent variables are analysed simultaneously with other independent variables. For establishing a relationship between the Variables and predict the subsequent change in the sub-parameter, the method of Multiple Regression is used.

A small overview of these methods are provided below:

5.2.1 Simple Linear Regression :

Simple Linear Regression describes the relationship between variables which can be expressed as a line to the observed data. Linear regression models use straight lines and establish how strong the relationship is between two quantitative variables. The R-squared value determines the same and extensively applied as ‘measure of "goodness-of-fit" especially for regression models’(Kvålseth, 1985, online.stat.psu.edu, 2018).

5.2.2 Co-relation:

A correlation matrix is a table which displays the correlation coefficients for different variables in an observational data. The matrix depicts inter-relationship between all possible pairs of values in a table. It is used to summarize a dataset, identify and depict patterns in the given data. The value for variables range from -1 to 1 where -1 shows a negative correlation between variables. The value 0, means no linear correlation is found between the variables.

5.2.3 Bar Charts and Pie Charts:

Bar charts plot numerical values under separate categories in a two-axis chart. The categories are depicted in each of the axes. For each category, a bar is drawn and its length along the other axis corresponds to the numerical value associated with the category.
The pie chart shows how the total amount is divided between separate categories in a circle divided into radial slices. Each category is associated with a slice whose size corresponds to the category's ratio to the total.

5.2.4 Multiple Linear Regression:

Multiple linear regression (MLR), or simply as multiple regression, is a statistical technique that uses various explanatory variables for projection of results of a response variable. The aim of multiple linear regression is to model the linear relationship between the explanatory (independent) variables and response (dependent) variables (online.stat.psu.edu, 2018). Mathematically it can be represented as follows:

$$yi=\beta 0+\beta 1xi1+\beta 2xi2+...+\beta pxip+\epsilon \quad \text{.....Equation 01}$$

where, for $i=n$ observations:

yi = dependent variable

xi = explanatory variables

$\beta 0$ = y-intercept (constant term)

βp = slope coefficients for each explanatory variable

ϵ = the model's error term (also known as the residuals)

In this thesis, the **Microsoft Excel Multiple Linear Regression Tool** has been used to derive the equations for each dependent variable for each parameter viz., Vitality, Liveability and Sense of Place.

5.3 Results and Discussion

Using the above methods, each of the parameter has been analysed separately and the results for the same has been discussed below.

5.3.1 Vitality

In this section, the data related to the parameter of Vitality is analysed with the help of the sub-parameters of Activity and Public Space (Refer Chap 3, Table 3-5). Activity is measured by the variables Pedestrian flows, Amount of Commercial Built Use Activity , Nature of Commercial Activity and Product Mix (Refer Chap 3, Table 3-5). Public Space is measured by the variables amounts and types of Formal Public space and amounts and types of Informal Public Space (Refer Chap 3, Table 3-5). Identification of dependent and independent variables with respect to the sub-parameters are done as follows:

5.3.1.1 Activity:

The first sub-parameter of Vitality is Activity. In this case the data collected has been found to change with time especially due to the present pandemic giving rise to understanding the dependability in 3 different years viz. 2019, 2021 and 2022.

Simple Linear Regression shows the following change patterns in case of markets and malls in terms of **Pedestrian Flow (Pf)** (y-axis) and **Amount of Built Use (Commercial)** (x-axis).

2019

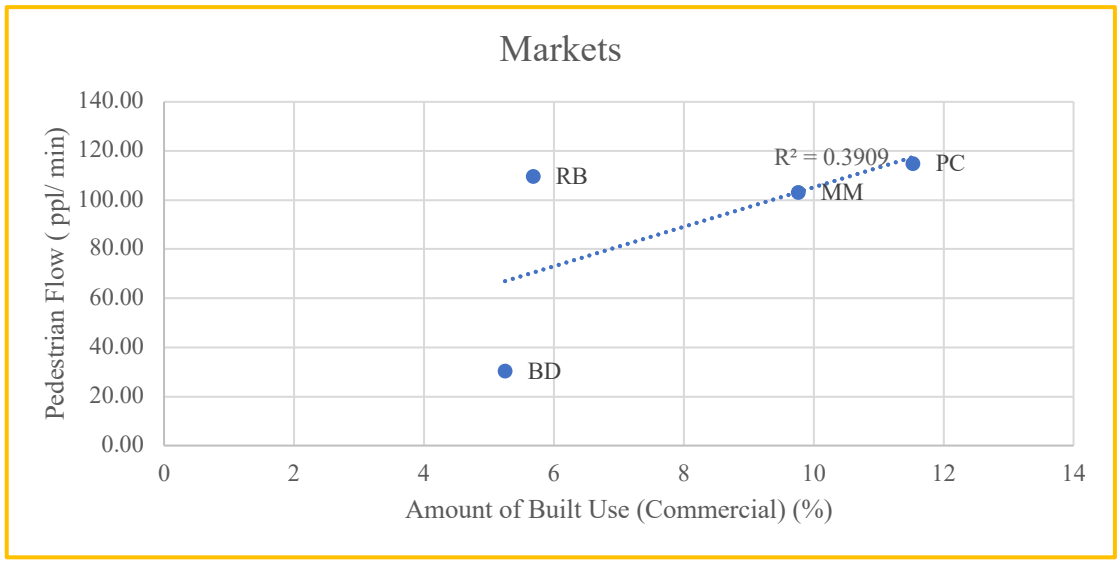


Figure 5-2 : Simple Linear Regression showing relationship between Pedestrian Flows for Markets in 2019. (Source: Author)

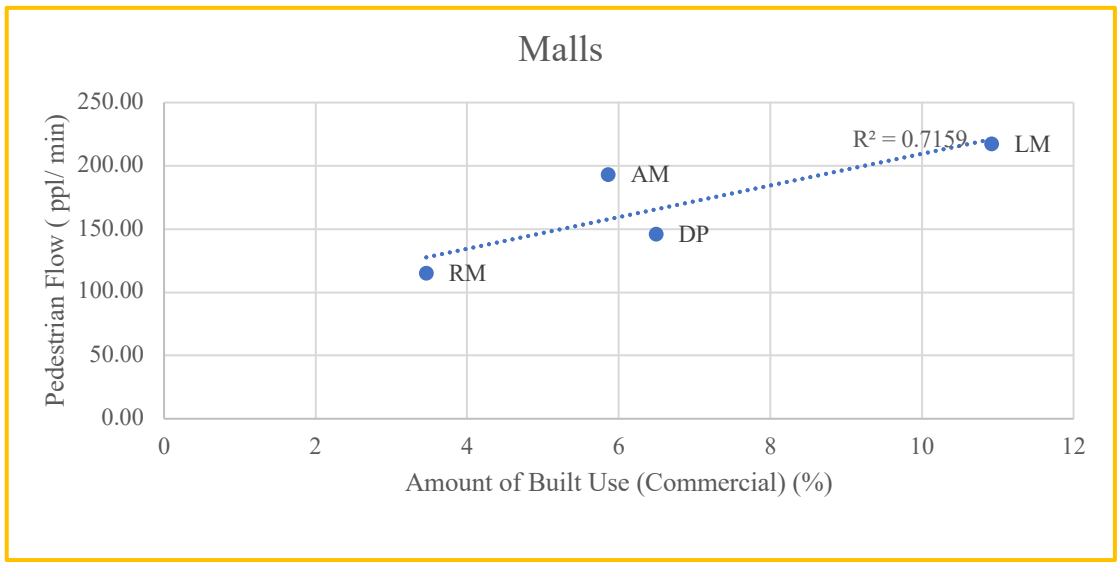


Figure 5-2 : Simple Linear Regression showing relationship between Pedestrian Flows for Malls 2019. (Source: Author)

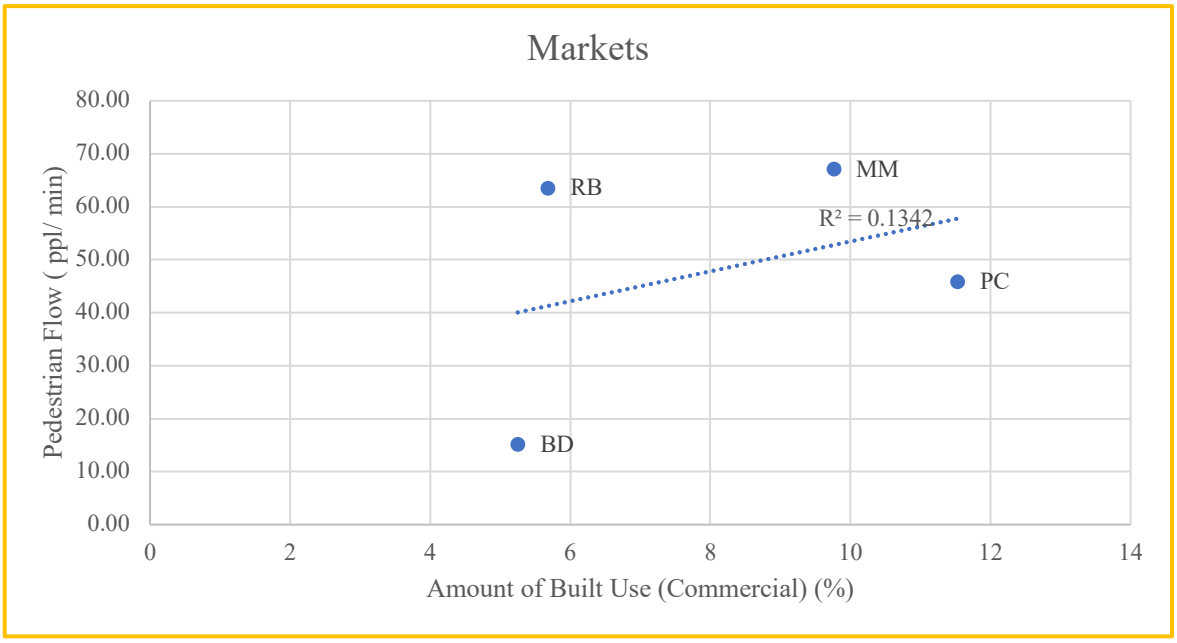


Figure 5-3 : Simple Linear Regression showing relationship between Pedestrian Flows for Markets in 2021. (Source: Author)

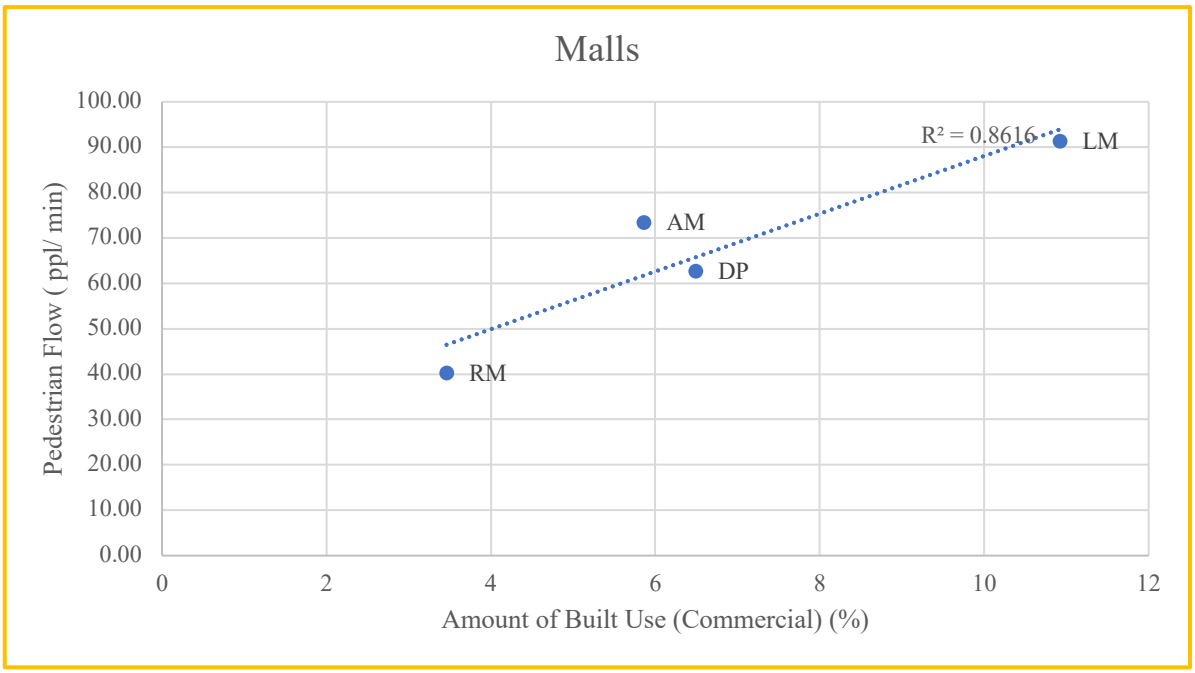


Figure 5-4 : Simple Linear Regression showing relationship between Pedestrian Flows for Malls 2021. (Source: Author)

2022

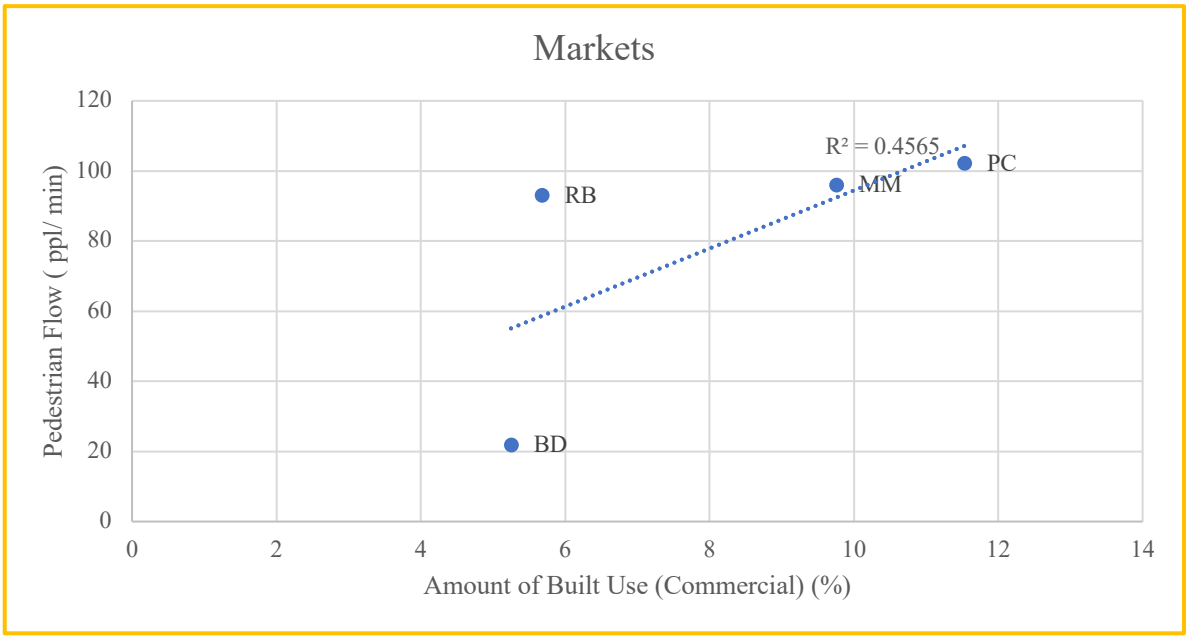


Figure 5-5 : Simple Linear Regression showing relationship between Pedestrian Flows for Markets in 2022. (Source: Author)

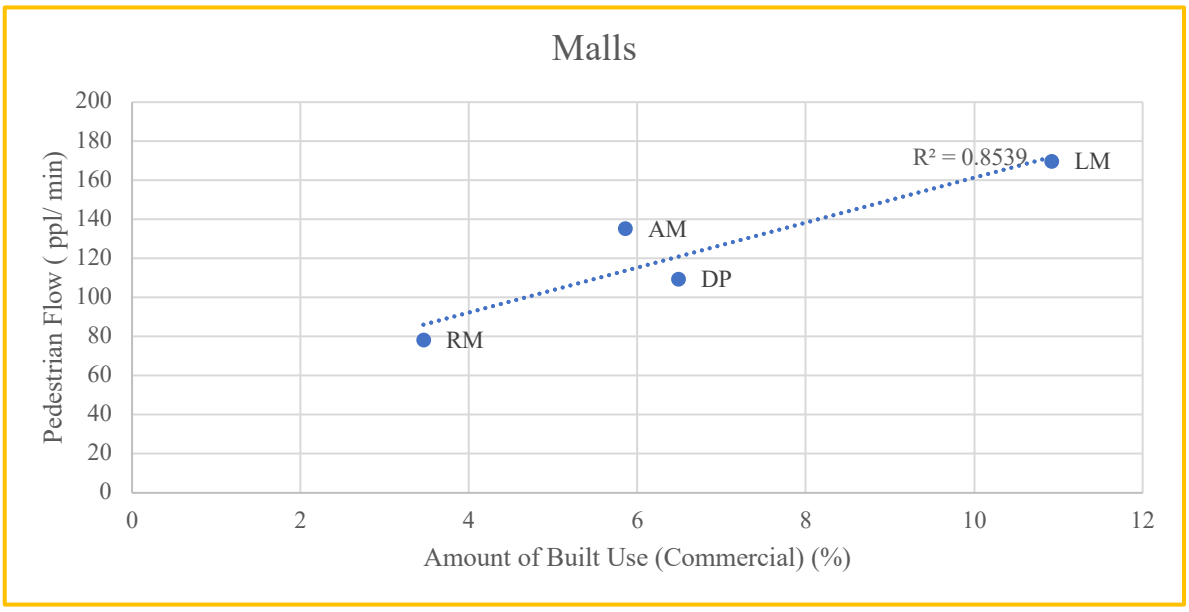


Figure 5-6 : Simple Linear Regression showing relationship between Pedestrian Flows for Malls 2022. (Source: Author)

In case of quantitative variables, it has been seen through the relation matrix that malls have higher dependency of Pedestrian Flow (Pf) with respect to the Amount of Commercial Activity. The R-squared value for both Markets (0.39.0 to 0.4565) and Malls (0.7159 to 0.8539) have both increased over the period from 2019 to 2022. The R-squared value reveals that over time, irrespective of the typology of Commercial Centre, Pedestrian Flow (Pf) has been dependent on the amount of Building Use dedicated to Commercial Activity, which ensures rise in publicness of the area subsequently contributing to Vitality of the area.

Pedestrian Flow (Pf) was also seen to be influenced by **Typology of Commercial Activity** present in the study areas. The following Correlation matrices determine strikingly high.

Markets			
	Pedestrian Flow (Pf)	*Formal Commercial Activity*	*Informal Commercial Activity*
Pedestrian Flow (Pf)	1	0.922608	0.977166
Formal Commercial Activity	0.922608	1	0.983502
Informal Commercial Activity	0.977166	0.983502	1

Table 5-1: Correlation matrix between pedestrian flows and types of Commercial Activity for Markets (Source: Author)

Malls			
	Pedestrian Flow	*Formal Commercial Activity*	*Informal Commercial Activity*
Pedestrian Flow	1	0.790353	0.998763
Formal Commercial Activity	0.790353	1	0.819845
Informal Commercial Activity	0.998763	0.819845	1

Table 5-2: Correlation matrix between pedestrian flows and types of Commercial Activity for Malls (Source: Author)

The R-squared value, in case of Markets (0.922608), shows that Pedestrian Flow (Pf) depends higher on Formal Commercial Activity than Malls (0.790353). Informal Activity (Markets: 0.983502 and Malls: 0.998763) in both cases highly influences Pedestrian flows irrespective of the typology of Commercial Centre.

It can be inferred that **Pedestrian Flow (Pf)** is **most dependent variable to determine** the extent of influence of the CC determining the **amount and type of Commercial Activity** in the area.

5.3.1.2 Public Space

The transformation of Public Space in relationship to Markets and Malls have been analysed with the help of Simple Linear Regression. The graphs generated for the same has been given below.

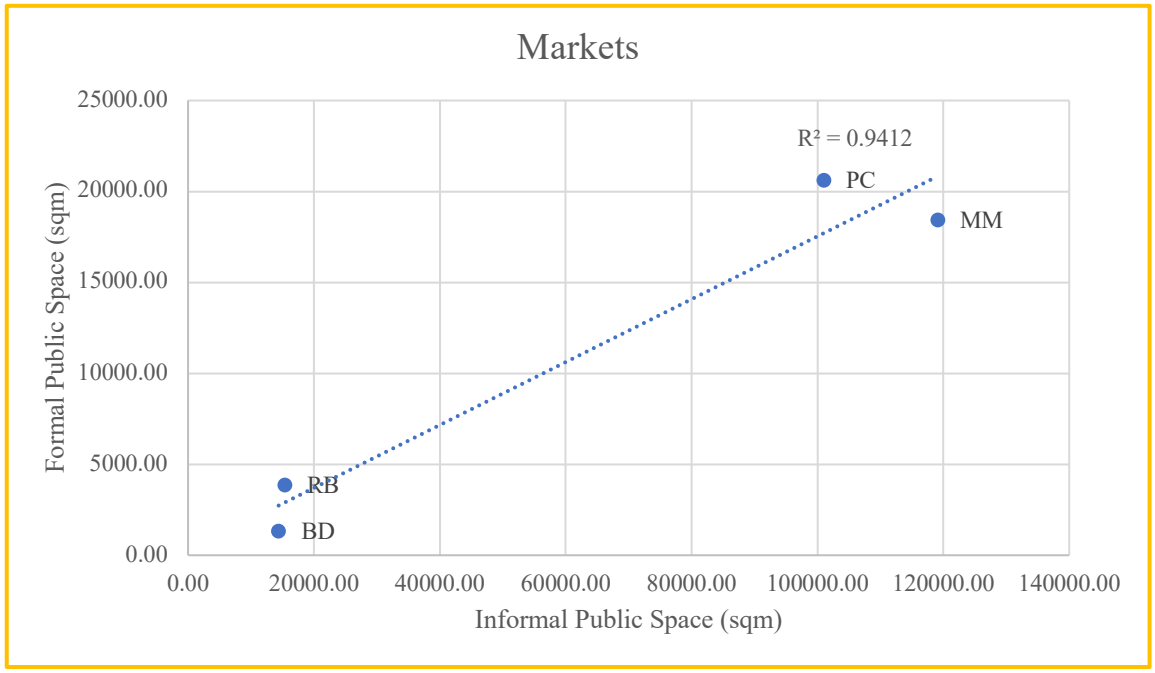


Figure 5-7: Simple Linear Regression showing relationship between Formal and Informal Public Spaces for Markets. (Source: Author)

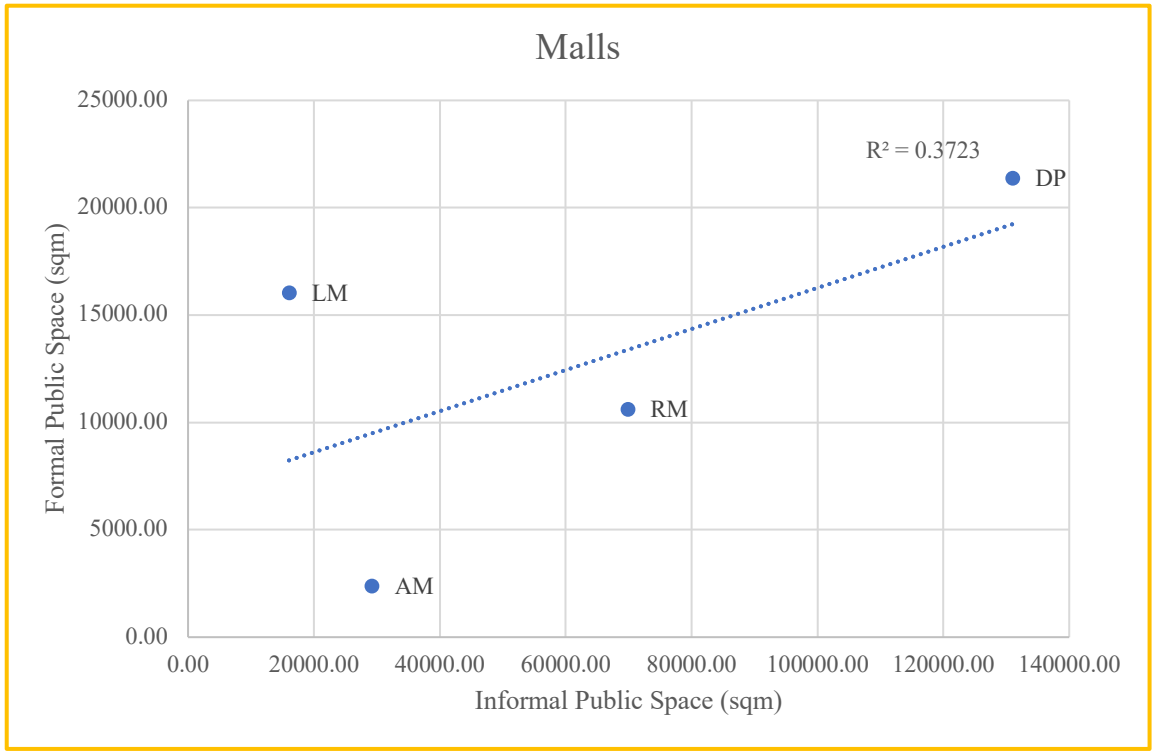


Figure 5-8: Simple Linear Regression showing relationship between Formal and Informal Public Spaces for Malls. (Source: Author)

It shows that Markets thrive on amount of Informal Public Space (0.9412) surrounding the Formal Public Space. Malls on the contrary, are functions where Formal Public Spaces is less dependent on the kind of Informal Public Space (0.3723) that gets generated.

From the qualitative factors (Refer Chap 04; Tables : 4-5, 4-15, 4-25, 4-35) the following observations were made.

The type of Formal public space is more varied in case of markets as compared to Malls.

The variety of Informal Public spaces are more in case of Markets as compared to Malls.

Malls are mostly situated along the main arterial roads thus the variety of public spaces is not as varied as the marketplaces which are located both along arterial roads and within the neighbourhoods.

It is known from Literature it can be seen that Formal and Informal commercial Activity generate Formal and Informal Public Space. It is seen that Formal and Informal Public Spaces ensures a lively public place thus the kind of public space directly influence the Pedestrian Flows (Pf).

5.3.1.3 Inference

From the above analysis it can be said that Pedestrian Flow (Pf) is the most affected in case of any transformation of CC. It is imperative to plan and design Commercial Activity with proper distribution of formal activity and inclusion of spaces for informal activity to increase the Pedestrian Flow (Pf) of the neighbourhood and the adjoining areas.

It is also seen that the variable of **Pedestrian flow (Pf)** changes with changes in amounts of **Built Use (Commercial)(BU) , Formal Public Space (FPS) and Informal Public Space (IPS).** Multiple Regression Analysis is carried out using the **Microsoft Excel Multiple Linear Regression Tool** considering the following:

yi = Pedestrian Flows (Pf)
xi_1 = Formal Public Space (FPS)
xi_2 = Informal Public Space (IPS)
xi_3 = Amount of Built Use (Commercial) (BU)

A mathematical relationship between them can be derived in the following manner using the **Microsoft Excel Multiple Linear Regression Tool** as previously shown in Equation 1 (Refer 5.2.4).

$$Pf = 131.985 - 0.002 \times FPS + 0.02 \times IPS - 13.51 \times BU$$

The r-squared value for the same is **0.883855334 s**howing high dependency.
The related coefficients are as follows:

Variables	Coefficients
y-intercept ($\beta 0$)	131.9852675
Formal Public Space (xi_1)	-0.001960523
Informal Public Space (xi_2)	0.017060596
Built Use (xi_3)	-13.5175194

The goodness-to-fit plots for each of the independent variables shown below depicts the closeness of the observed values with the predicted values of the dependent variable Pedestrian flows (PF).

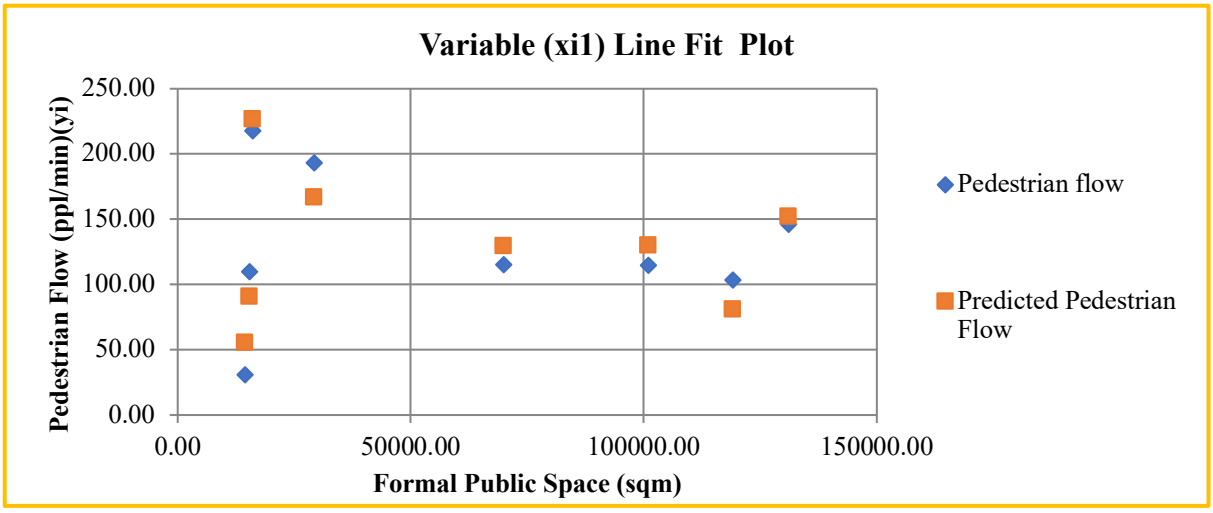


Figure 5-9: Variable Line Fit Plot for Formal Public Space. (Source: Author)

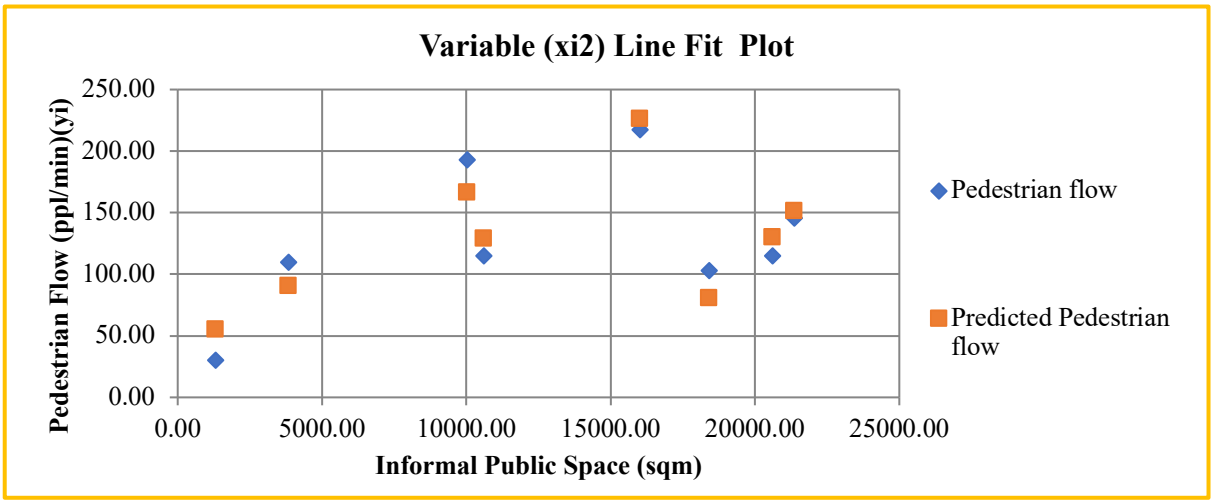


Figure 5-10: Variable Line Fit Plot for Informal Public Space. (Source:Author)

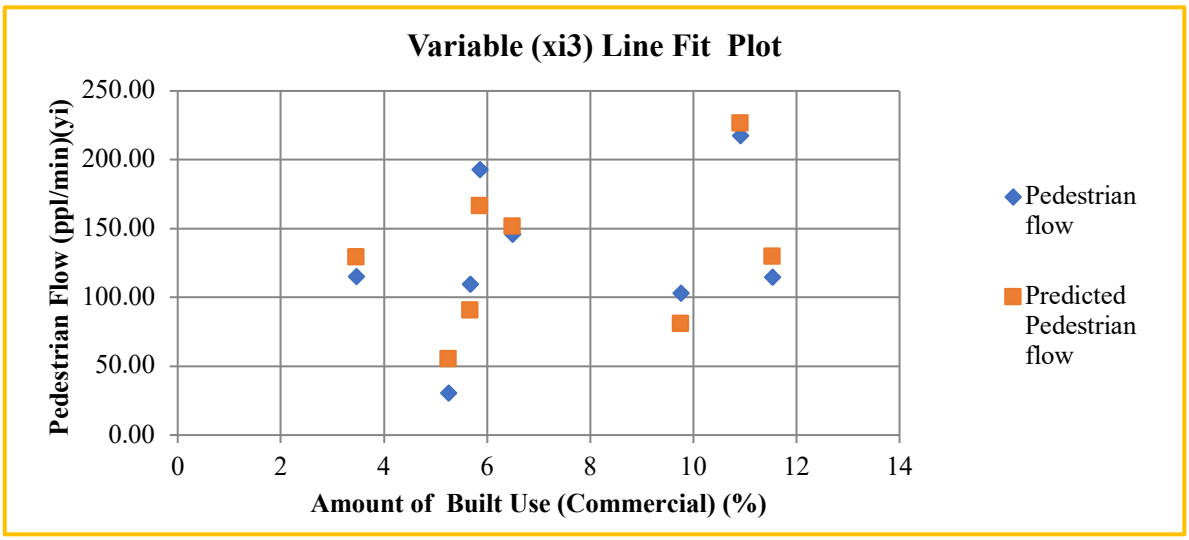


Figure 5-11: Variable Line Fit Plot for Amount of Built Use (Commercial). (Source: Author)

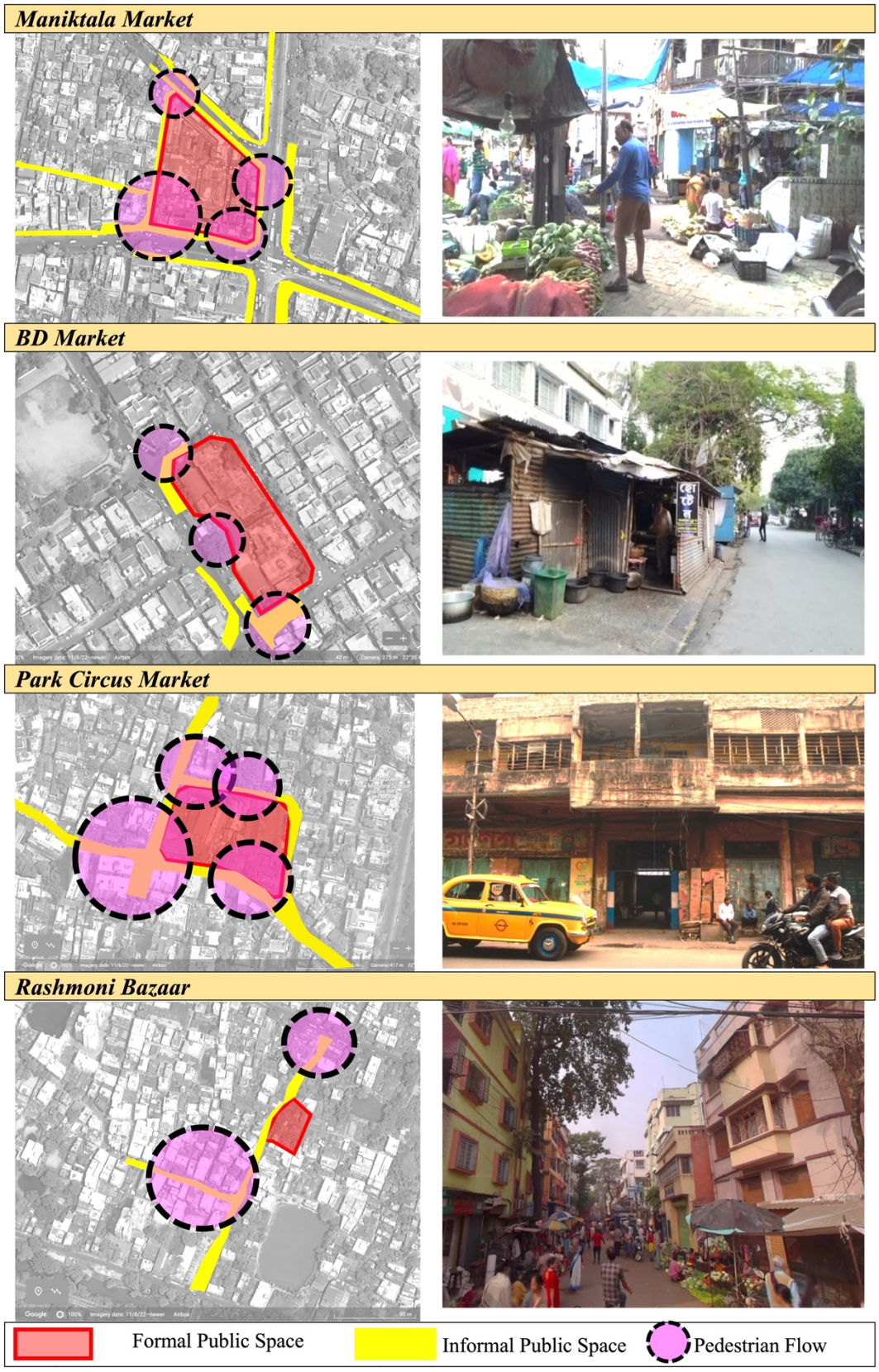


Figure 5-12: Present state of Pedestrian flow with respect to formal and informal public spaces in the vicinity of CC (Markets). (Maps: Generated through survey data, Image Source: Author)

Figure 5-13: Present state of Pedestrian flow with respect to formal and informal public spaces in the vicinity of CC (Malls). (Maps: Generated through survey data, Image Source: Author)

5.3.2 Liveability

In this section, the data related to the parameter of Liveability is analysed with the help of the sub-parameters of Location, Accessibility and Safety (Refer Chap 3, Table 3-7). Location is measured by the variables Size of Commercial Centre, Distance of CC from CBD, Routes (Area Level) and Layout of Commercial Centre (Refer Chap 3, Table 3-7). Accessibility is measured by the variables Distance of CC from neighbourhoods, Time taken to access, Routes (Site Level) and Mode of Travel (Refer Chap 3, Table 3-7).. Safety is measured by Natural Surveillance (No. of Active Frontages), Mechanical Surveillance (No. of Patrol booths and Security Cameras), Types of Pathways (Open or Closed) and Types of Lighting (Refer Chap 3, Table 3-7). Identification of dependent and independent variables with respect to the sub-parameters are done as follows:

5.3.2.1 Location:

The first sub-parameter, Location is measured by Size of Commercial Centre, Distance of CC from CBD, Routes (Area Level) and Layout of Commercial Centre.

Simple Linear Regression shows the following change patterns in case of markets and malls in terms of **Size of CC** (y-axis) and **Distance of CC from CBD** (x-axis).

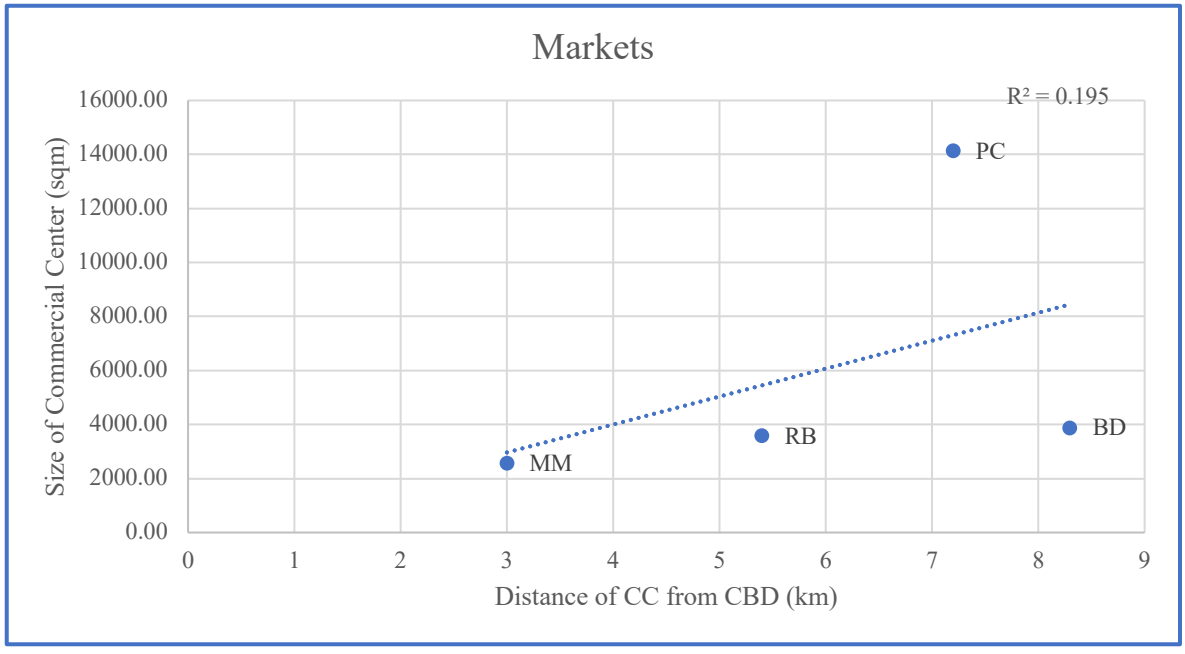


Figure 5-14 : *Simple Linear Regression showing relationship between Size of CC and Distance of CC from CBD for Markets. (Source: Author)*

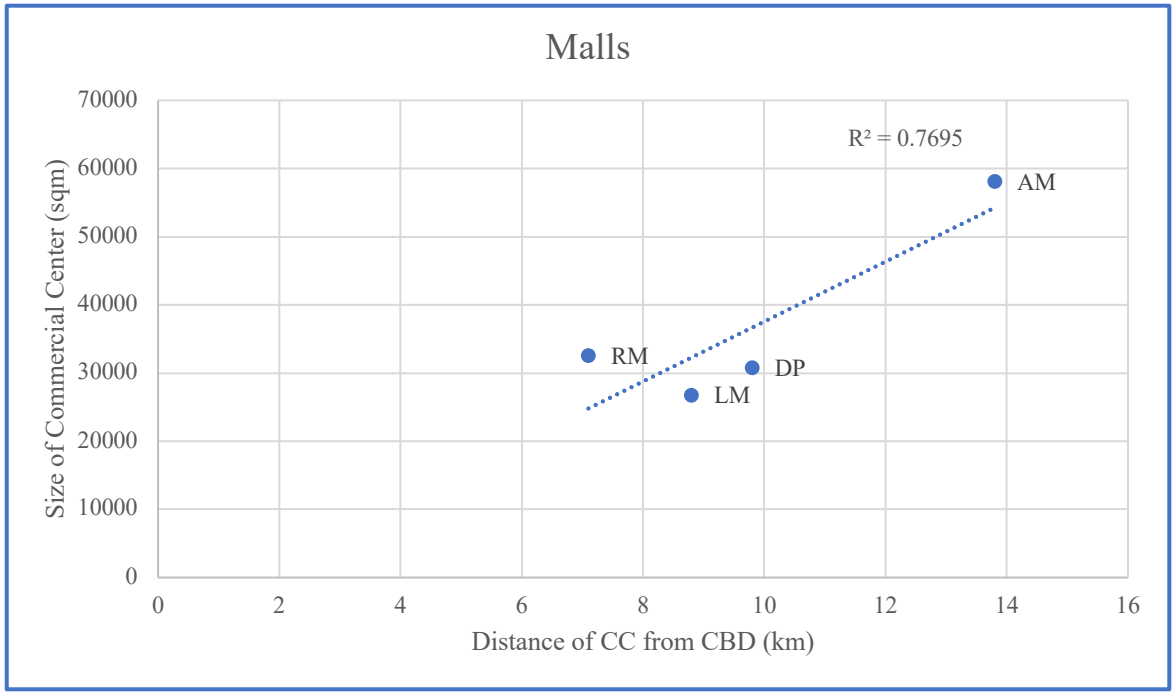


Figure 5-15 : *Simple Linear Regression showing relationship between Size of CC and Distance of CC from CBD for Malls. (Source: Author)*

From the quantitative data, it can be seen that **size of CC** increases with **distance from CBD** which can be clearly shown in the plots where the malls (0.7695) become larger as they move away from the city centre but markets (0.195) have no such effect whatsoever.

Markets	Routes- Area level	Routes- Area level				Layout
		Major Arterial Road	Arterial Road	Sub Arterial Road	Collector road	
Case A- Maniktala	2 major arterial roads (24 m wide APC road & 20 m wide Bidhan Sarani)	2	0	1	1	2 storeyed U-shaped building, 1 storey market, informal shops
Case B- BD Market	Located along Secondary Road - BD Block	0	0	1	3	2 storied U type Building
Case C-Park Circus	Secondary road – Beck began Row	0	0	1	3	2 storied U type Building
Case D- Rashmoni Bazar	Connected to tertiary road	0	0	1	3	One storey Informal

Table 5-3 : Qualitative variables for Markets with respect to Location. (Source: Author)

Malls	Routes- Area level	Routes- Area level				Layout
		Major Arterial Road	Arterial Road	Sub Arterial Road	Collector road	
Case A- Rangoli Mall	1 Secondary road (Girish Ghosh Road)	0	0	1	1	5 storeyed linear rectangular
Case B- Diamond Plaza	Located along Main Arterial Road - Jessore Road	0	1	0	1	6 storied rectangular box
Case C- Lake Mall	Primary Road – Rashbehari Avenue	0	1	0	3	7 storied rectangular bldg., GF- Market, other floor - Mall
Case D- Acropolis Mall	Connected to Primary road- Rashbehari Connector	0	1	1	1	20 storeyed rectangular box, 5 floors mall, rest are offices

Table 5-4 : Qualitative variables for Malls with respect to Location. (Source: Author)

From the qualitative data (Tables 5-3, 5-4), it was found that Malls are mostly located along the arterial roads making them more accessible as commercial centres but markets are located more along the neighbourhoods making them more walkable destinations.

It can be concluded that, Size of CC and Distance of CC from CBD are both affected due to transformation. Size of CC is dependent on the Distance of CC from CBD.

5.3.2.2 Accessibility:

The second sub-parameter to access liveability is Accessibility measured by Distance of CC from Neighbourhoods and time taken to access as quantitative parameters and site level access routes and modes of transport for the qualitative parameters.

Simple Linear Regression shows the following change patterns in case of markets and malls in terms of **Time taken to Access** (y-axis) and **Distance of CC from neighbourhoods** (x-axis).

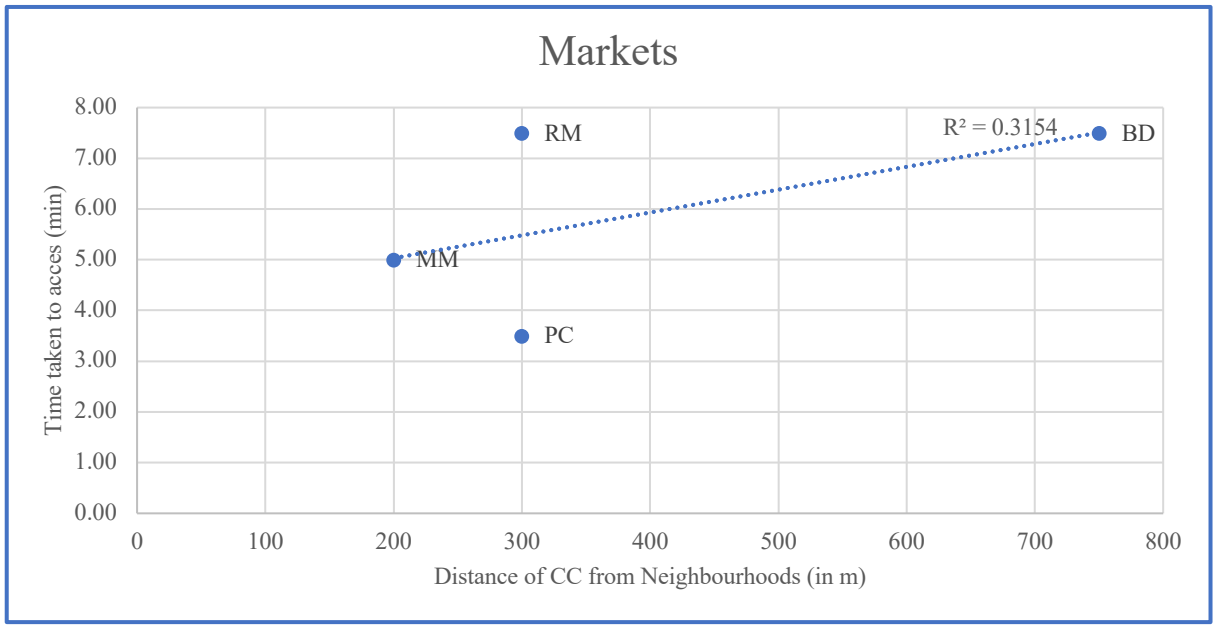


Figure 5-16: Simple Linear Regression showing relationship between Time of Access and Distance of CC from neighbourhood for Markets. (Source: Author)

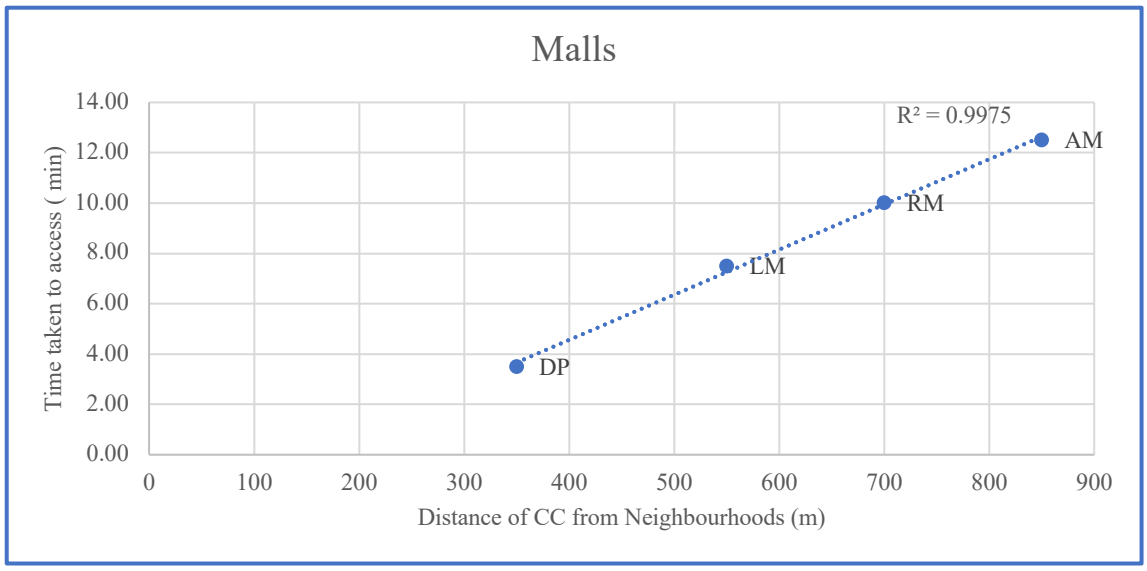


Figure 5-17: Simple Linear Regression showing relationship between Time of Access and Distance of CC from neighbourhood for Malls. (Source: Author)

Analysis of the quantitative data shows that depending on the availability of transportation, the time taken to access is more dependent on Distance of CC from neighbourhoods in case of Malls (0.9975) as compared to Markets (0.3154).

The following figures represent the qualitative data for Access points and Mode of transportation taken using bar charts.

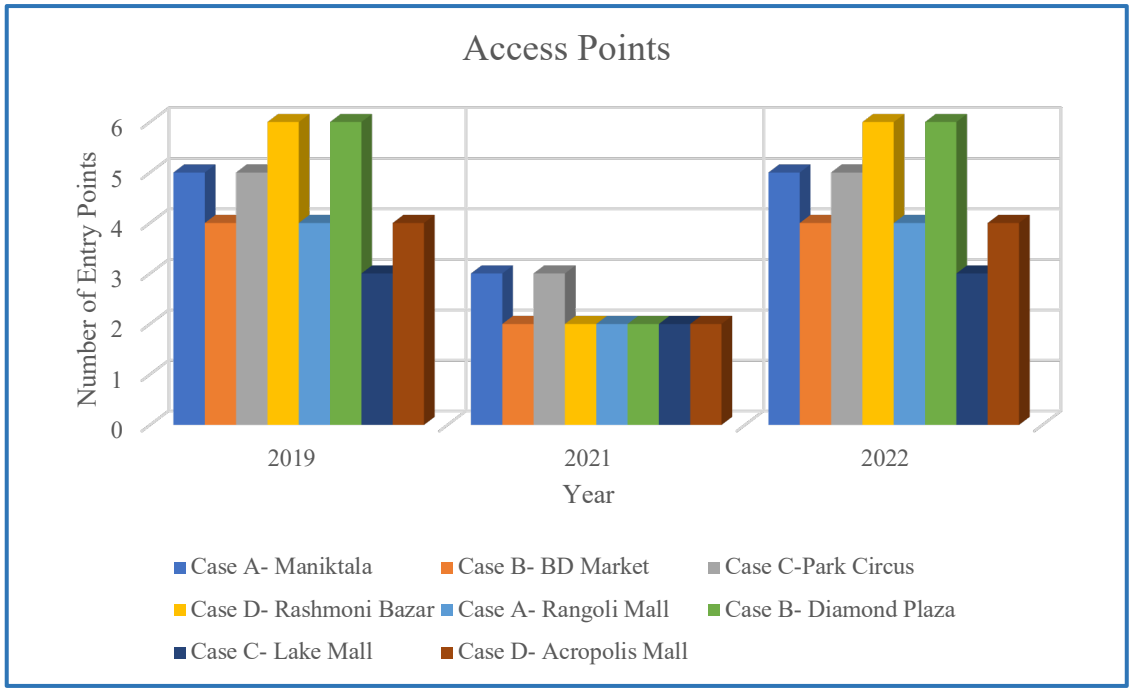


Figure 5-18: Bar charts representing the number of Access points for each CC. (Source: Author)

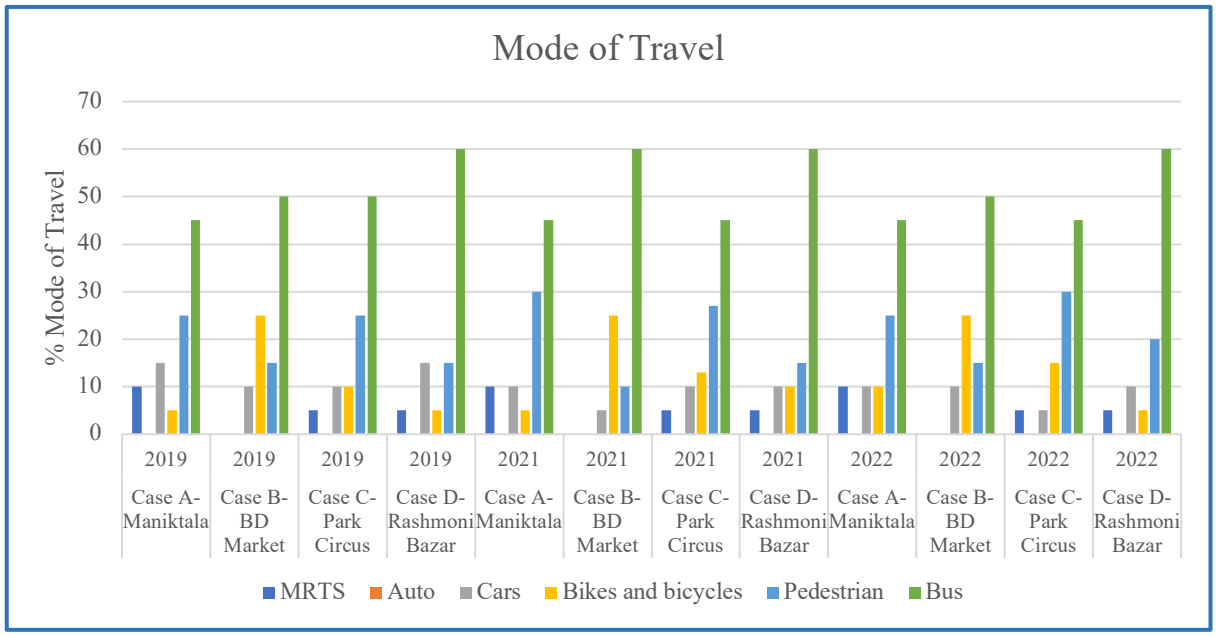


Figure 5-19: Bar charts representing the modes of transportation taken for Markets.

(Source: Author)

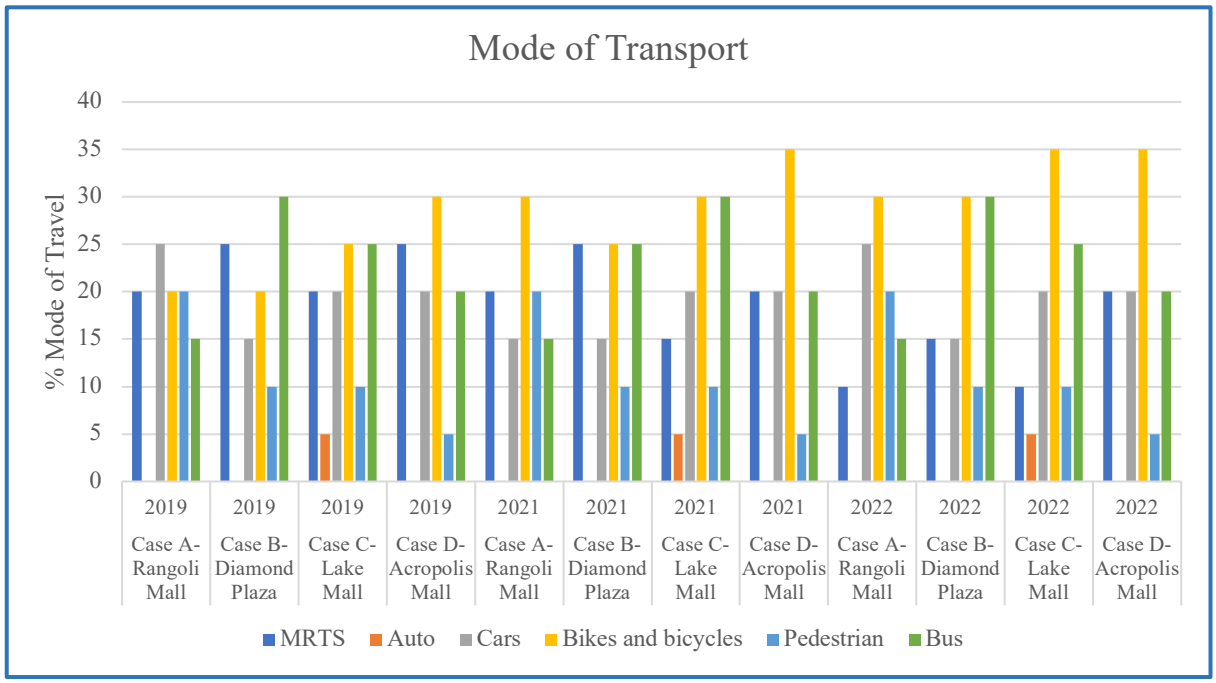


Figure 5-20: Bar charts representing the modes of transportation taken for Markets

.(Source: Author)

Analysis of qualitative data shows Malls are accessed commonly by public transport and private vehicles whereas major traffic for Markets are pedestrians making markets more accessible than malls.

5.3.2.3 Safety:

The 3rd sub parameter of Safety can be best measured quantitatively by presence of Natural Surveillance and Mechanical surveillance. Qualitative variables for safety will be types of pathways for access and types of lighting.

Bar diagrams are used to represent the qualitative and quantitative data for Safety.

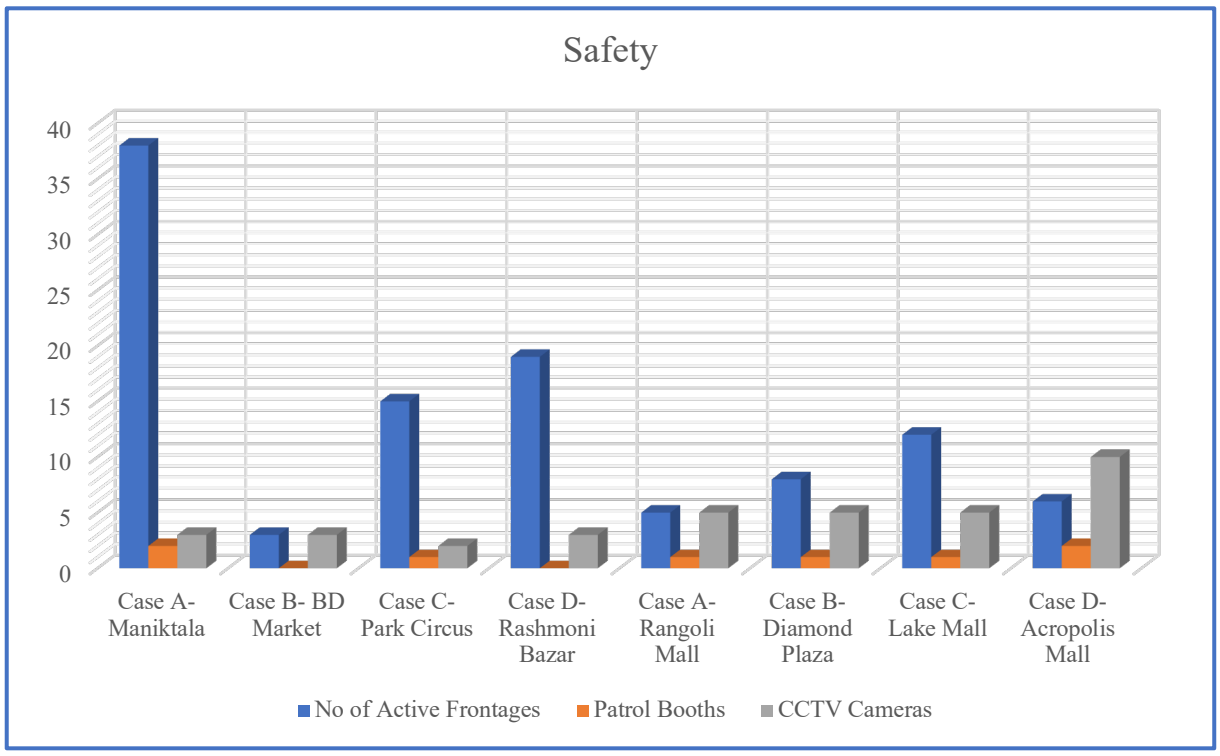


Figure 5-21: Bar Charts representing the quantitative data for amount Natural and Mechanical Surveillance present in each CC. (Source: Author)

The quantitative parameters show that the markets with higher number of active frontages showcase a safer public space as compared to the malls. Considering the informal spaces around markets are higher than malls, markets are safer.

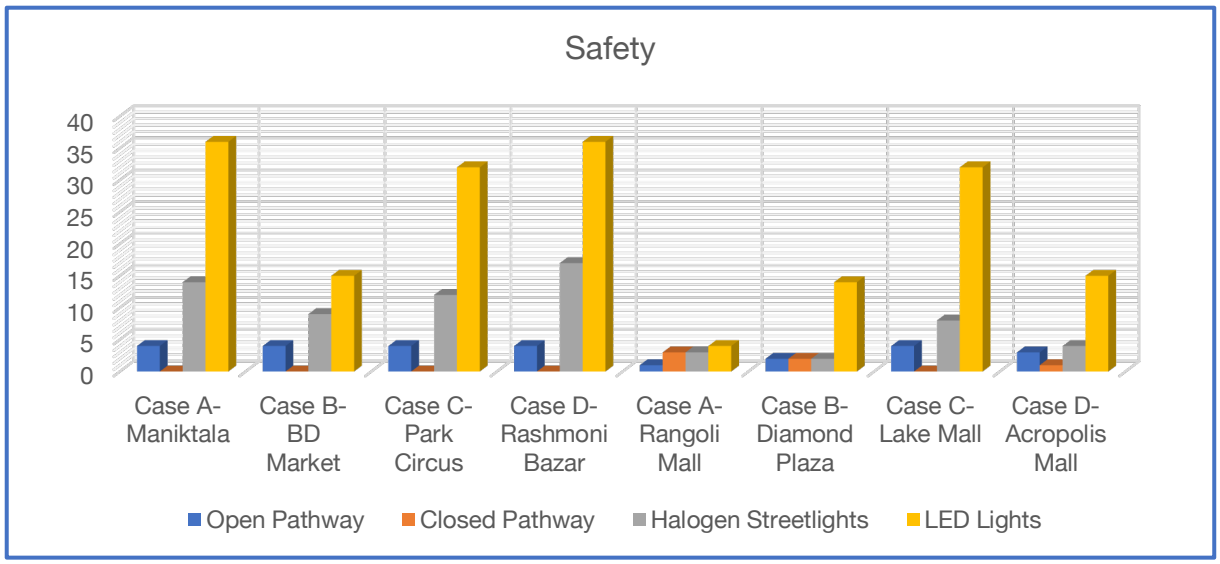


Figure 5-22: Bar Charts representing the qualitative data for amount Natural and Mechanical Surveillance present in each CC. (Source: Author)

From the qualitative data it can be Markets are accessed from all sides with presence of lighting on all sides due to presence of informal sectors making them safer as a public space s compared to malls.

5.3.2.3 Inference

From the above comparisons it can be seen that location and accessibility are the most influential parameters to liveability. The lack of temporal data for safety makes it secondary in this case.

From further analysis of the variables, it can be seen that the **Time taken to access (Ta)** is the dependent variable and **Size of Commercial Centres (S), Distance of CC from CBD (D_{CBD})** and **Distance of CC from Neighbourhood (D_N)** are the independent parameters. Multiple Regression Analysis is carried out considering the following:

y_i = Time taken to access (Ta)

xi_1 = Size of Commercial Centres (S)

xi_2 = Distance of CC from CBD (D_{CBD})

xi_3 = Distance of CC from Neighbourhood (D_N)

A mathematical relationship between them can be derived in the following manner using the **Microsoft Excel Multiple Linear Regression Tool** as previously shown in Equation 1 (Refer 5.2.4).

$$Ta = 3.925 + 0.0001 \times S - 0.362\, D_{CBD} \times +0.0075 \times D_n$$

The r-squared value for the same is **0.785142757**

The related coefficients are as follows:

Variables	Coefficients
y-intercept ($\beta 0$)	3.924912655
Size of Commercial Centres (S)	0.000108453
Distance of CC from CBD (D_{CBD})	-0.362268522
Distance of CC from Neighbourhood (D_N)	0.007473574

The goodness-to-fit plots for each of the independent variables shown below depicts the closeness of the observed values with the predicted values of the dependent variable Time taken to Access (Ta).

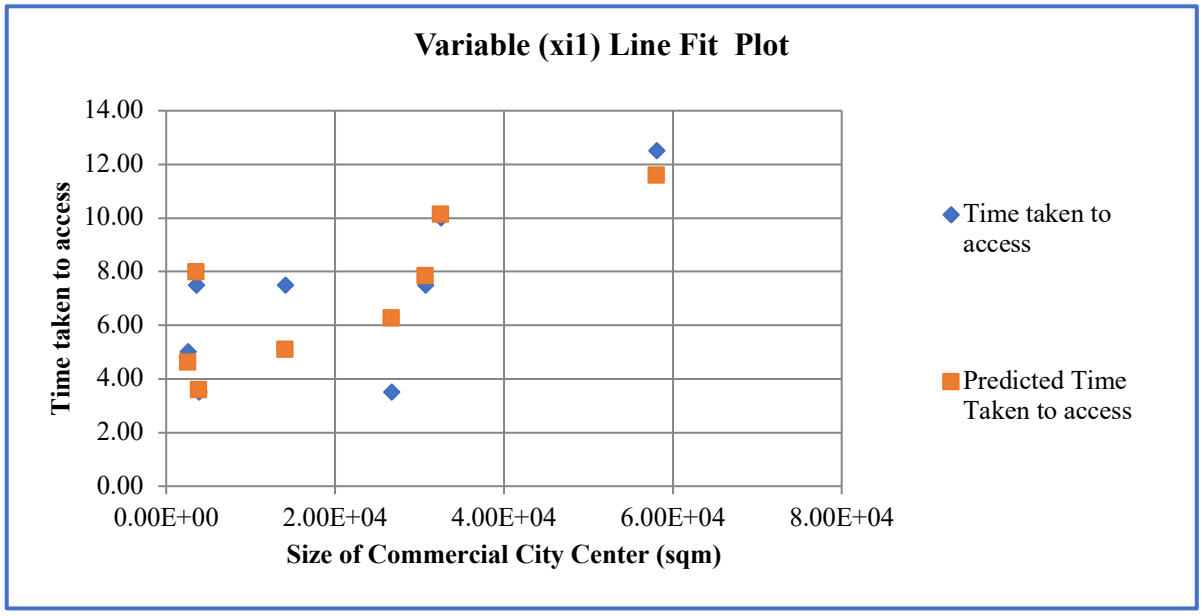


Figure 5-23:Variable Line Fit Plot for Size of Commercial Centre. (Source: Author)

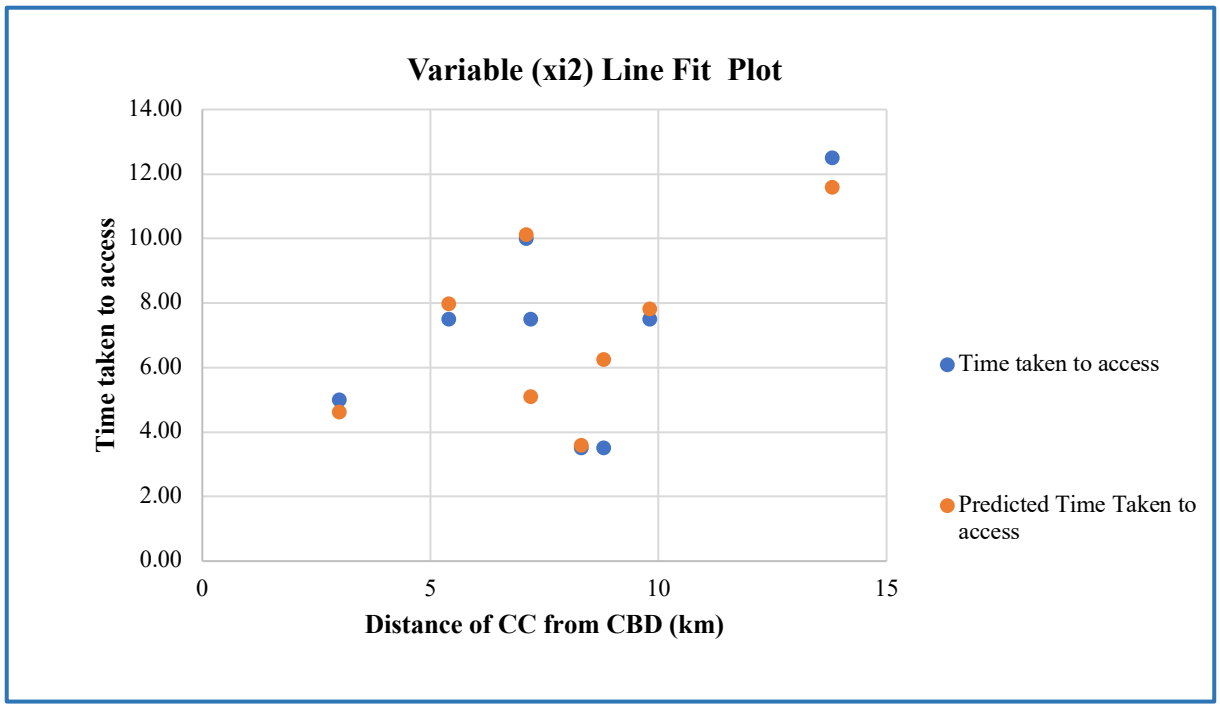


Figure 5-24:Variable Line Fit Plot for Distance of CC from CBD. (Source: Author)

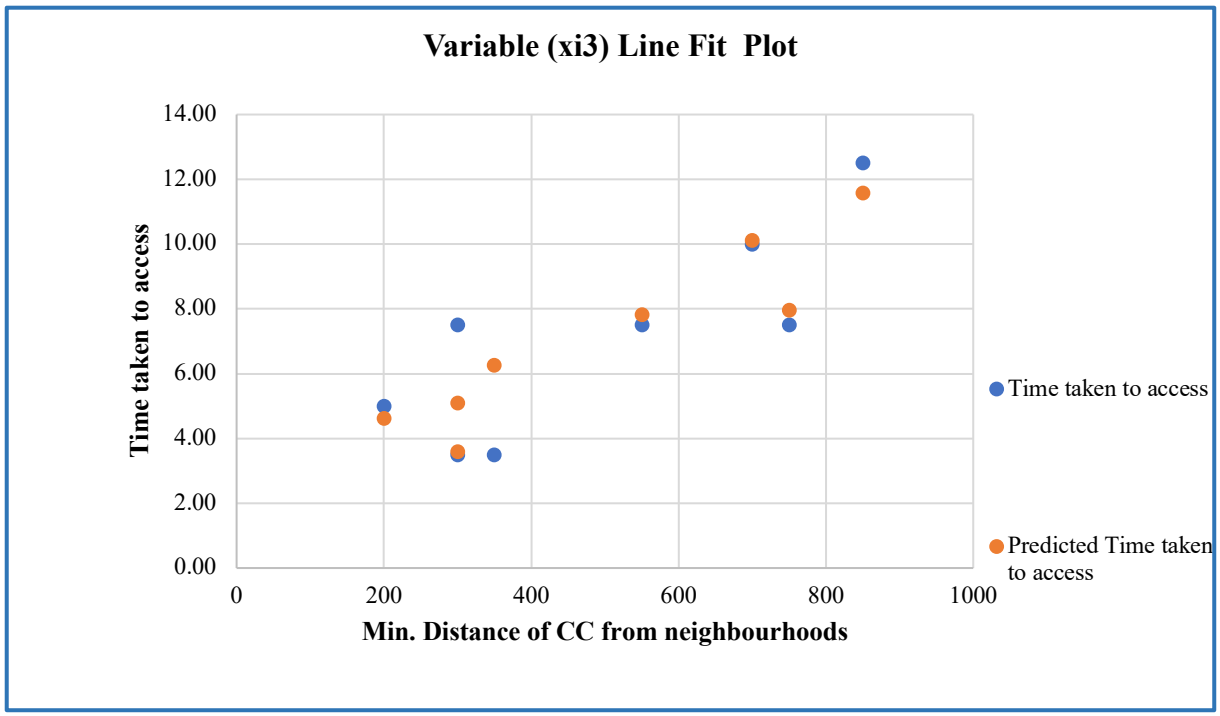


Figure 5-25:Variable Line Fit Plot for Distance of CC from neighbourhoods. (Source: Author)

Figure 5-26: Present state of Routes of in the vicinity of CC (Markets).

(Maps: Generated through survey data, Image Source: Author)

Figure 5-27: Present state of Routes of in the vicinity of CC (Malls).

(Maps: Generated through survey data, Image Source: Author)

5.3.3 Sense of Place:

In this section, the data related to the parameter of Sense of Place is analysed and a preliminary version of the finding are shown. The 3 sub-parameters of Sense of Place viz. **Urban Form, Visibility and Imageability** (Refer Chap 3, Table 3-9) are initially analysed to understand the dependability of Sense of Place to each of them.

5.3.3.1 Urban Form:

The first parameter of Sense of place is urban form which is measured quantitatively by street width, building height and building front offset (Refer Chap 3, Table 3-9). Qualitatively it can be assessed by Edge and shape of the urban form (Refer Chap 3, Table 3-9).

The following bar charts represent the **Street Width, Building Height and Building front Offset** for each selected CC in Kolkata

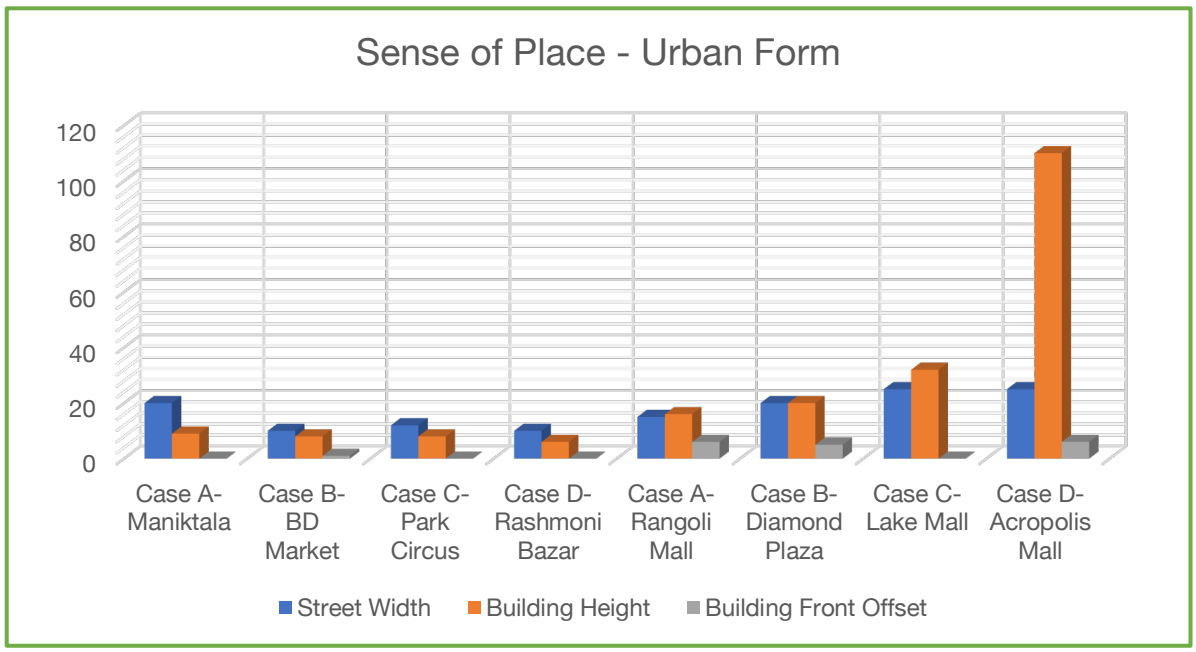


Figure 5-27: Bar Charts representing the quantitative data for Urban Form present in each CC. (Source: Author)

Markets	**Urban Form**	
	Edge	**Shape**
Case A- Maniktala	Permeable	Rectangular
Case B- BD Market	Defined	Square
Case C-Park Circus	Physically Permeable and overlapping	Rectangular
Case D- Rashmoni Bazar	Undefined , overlapping	Linear

Table 5-5: Qualitative variables for Markets with respect to Urban Form. (Source: Author)

Malls	Urban Form	
	Edge	**Shape**
Case A- Rangoli Mall	Defined, Controlled permeability	Linear
Case B- Diamond Plaza	Defined	Linear
Case C- Lake Mall	Physically Permeable	Linear
Case D- Acropolis Mall	Defined	Rectangular

Table 5-6: Qualitative variables for Malls with respect to Urban Form. (Source: Author)

From the quantitative and qualitative analysis its seen that Markets have lesser height and narrower approach road as compared to Malls which are more imposing with located along wider streets. It is also seen that market areas are more permeable with softer edges and better accessibility as compared to malls with more defined edges. Lack of temporal data make further analysis not possible at this stage. Height of Building is the dependent variable in Urban Form.

5.3.3.2 Visibility:

The second sub parameter for consideration is visibility. Quantitatively it can be measured by **maximum distance of Visibility, Height of visibility and angle of visibility** (Refer Chap 3, Table 3-9). Qualitatively it can be assessed by **district, edge, landmark and type of node** (Refer Chap 3, Table 3-9). Bar diagrams are used to represent the qualitative and quantitative data for Visibility.

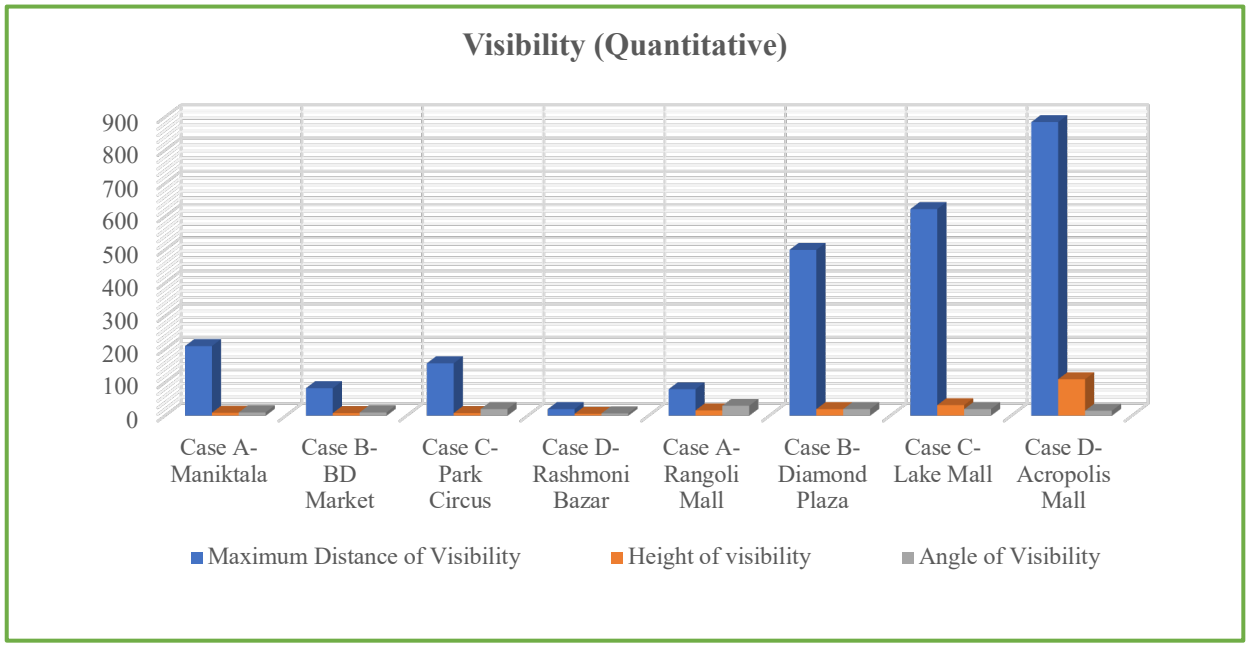


Figure 5-29: Bar Charts representing the quantitative data for Visibility present in each CC. (Source: Author)

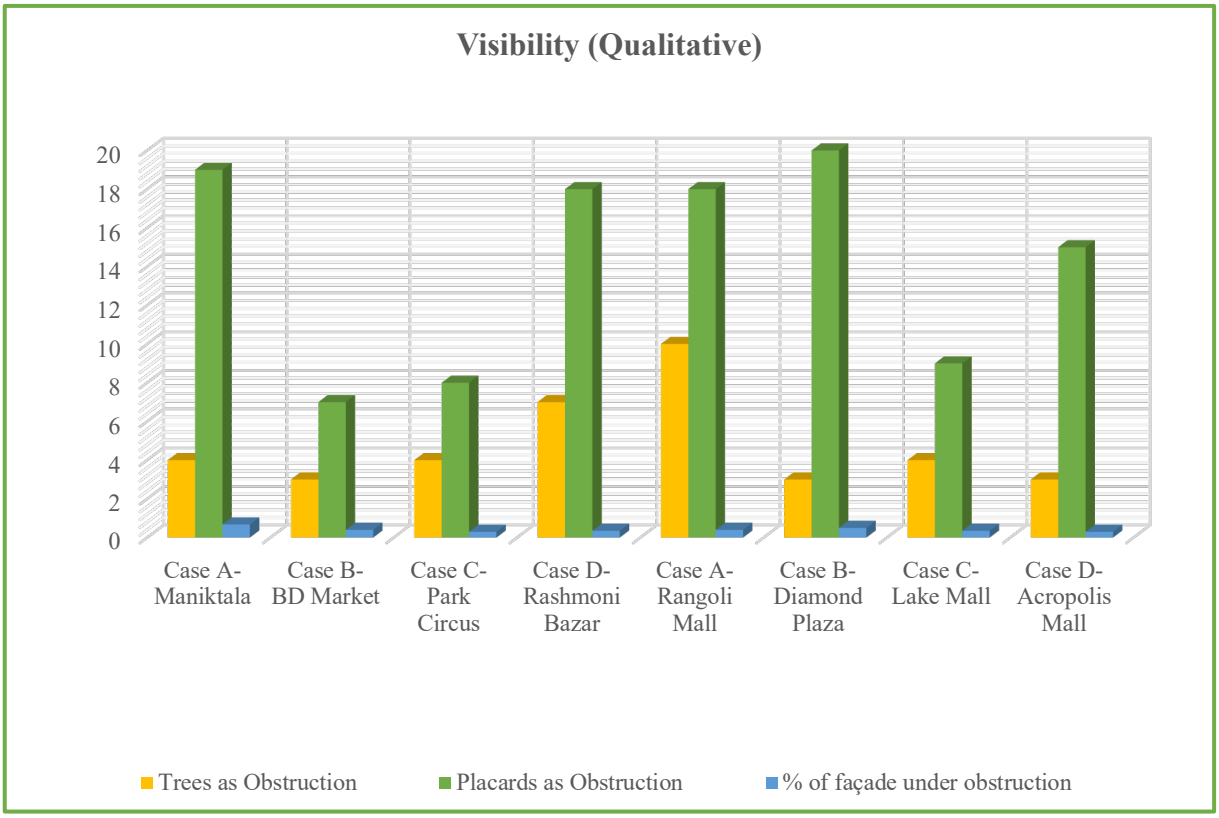


Figure 5-30: Bar Charts representing the qualitative data for Visibility present in each CC. (Source: Author)

From the quantitative and qualitative study it can be seen that Markets have lower Visibility due to low height of visibility, less front offset and higher amount of façade obstruction. Malls have higher visibility due to higher height, larger distance of visibility, higher angle of visibility and lesser façade obstruction. Height of visibility is equal to the height of building (Urban Form). Lack of temporal data make further analysis not possible at this stage.

5.3.3.3 Imageability:

The 3rd sub parameter for study is imageability. It can be understood **edge, district, landmarks, nodes and pathways** (Refer Chap 3, Table 3-9). The number and character of these variables can be used to determine the imageability of the commercial centre. It was found that sub-parameter Imageability is an independent and subjective parameter and does not depend on Urban form and Visibility. Lack of temporal data make further analysis not possible at this stage.

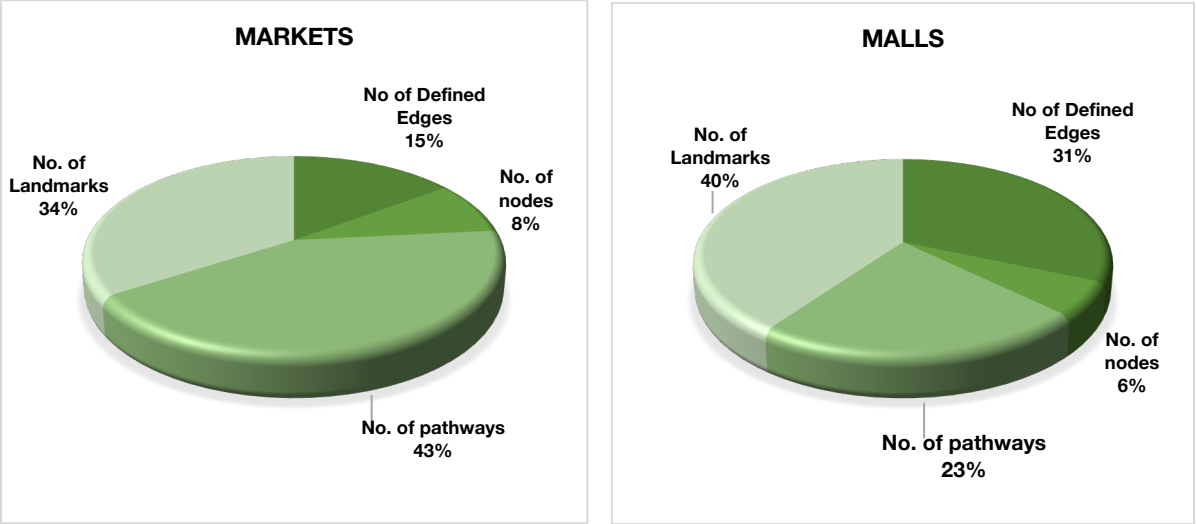


Figure 5-31: Pie Charts representing the qualitative data for Visibility present in each CC. (Source: Author)

5.3.3.4 Inferences

From the above comparisons it can be seen that all the sub parameters are essential and can function independently. But urban form and visibility are the most influential sub-parameters to sense of place as they are connected by the variable of Height of Building. The lack of temporal data for imageability makes it secondary in this study.

From further analysis of the variables, it can be seen that the **Height of Building (Hb)** is the dependent variable and **Street Width (SW), Building Front Offset (FO), maximum Distance of Visibility (D_{Vmax}) and Angle of Visibility (A_V)** are the independent parameters. Through the use of multiple regression the following equation can be derived considering the following:

yi = Height of Building (Hb)

xi_1 = Street Width (SW)

xi_2 = Building Front Offset (FO)

xi_3 = Max. Distance of Visibility (D_{Vmax})

xi_4 = Angle of Visibility (A_V)

A mathematical relationship between them can be derived in the following manner using the **Microsoft Excel Multiple Linear Regression Tool** as previously shown in Equation 1 (Refer 5.2.4).

$$Hb = 23.674 - 1.5121 \times SW + 4.433 \times FO + 0.1089 \times D_{Vmax} - 0.9974 \times A_v$$

The r-squared value fort he same is **0.846220937**

The related coefficients are as follows:

Variables	Coefficients
y-intercept ($\beta 0$)	23.67418909
Street Width (SW)	-1.512183609
Building Front Offset (FO)	4.433174846
Max. Distance of Visibility (D_{Vmax})	0.108884711
Angle of Visibility (A_V)	-0.997405155

The goodness-to-fit plots for each of the independent variables shown below depicts the closeness of the observed values with the predicted values of the dependent variable Height of Building (Hb).

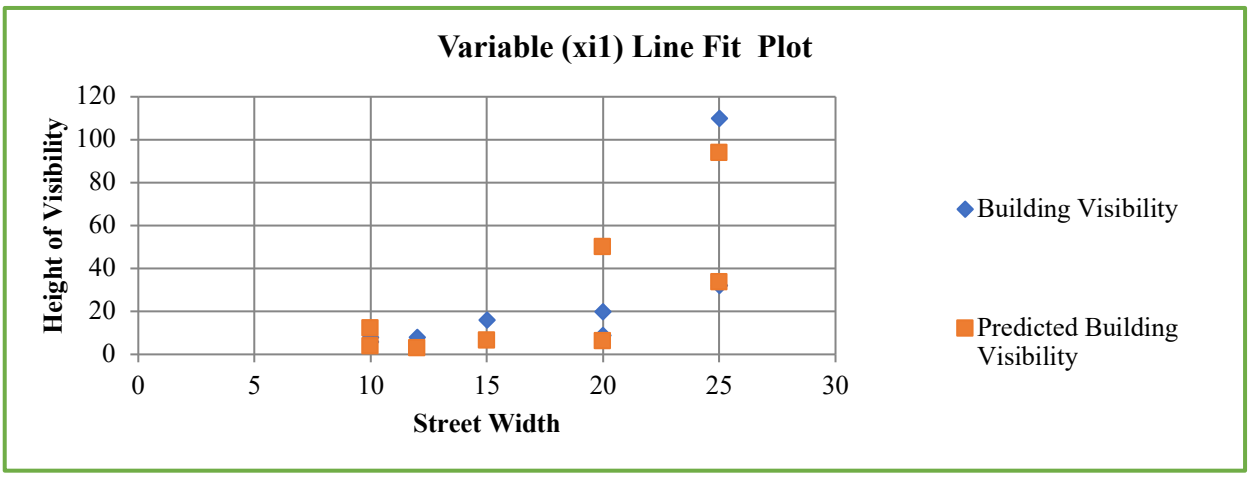


Figure 5-32:Variable Line Fit Plot for Street Width. (Source: Author)

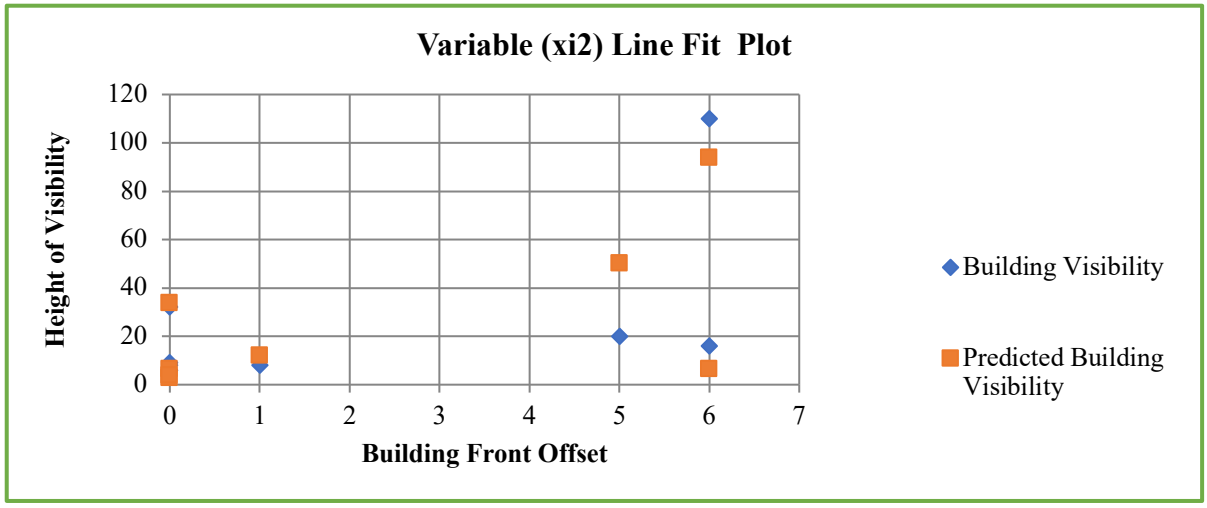


Figure 5-33:Variable Line Fit Plot for Building Front Offset (Source: Author)

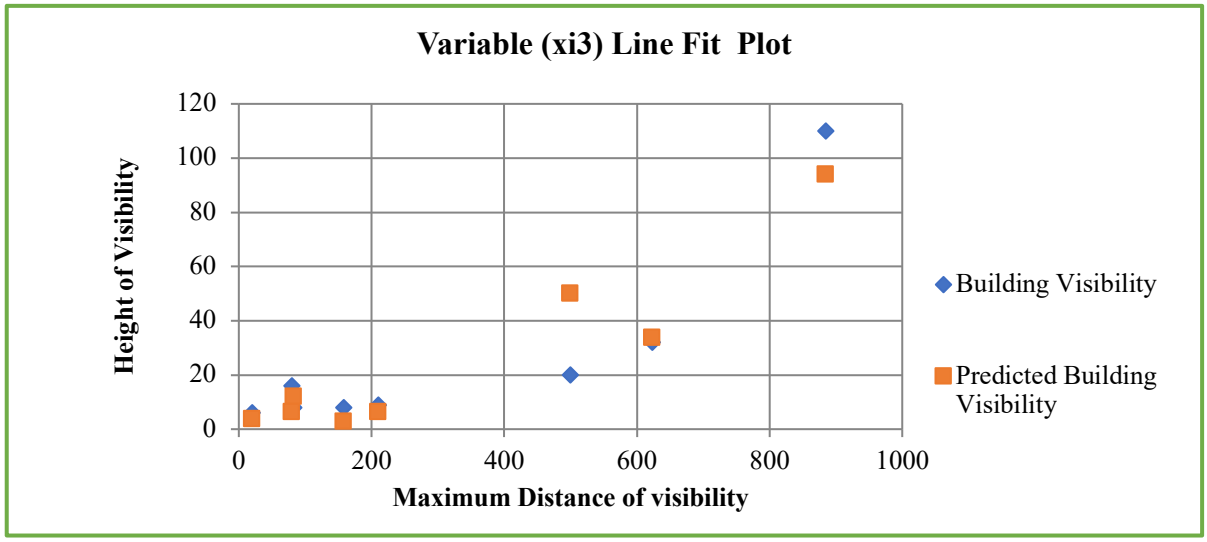


Figure 5-34:Variable Line Fit Plot for Maximum Distance of Visibility. (Source: Author)

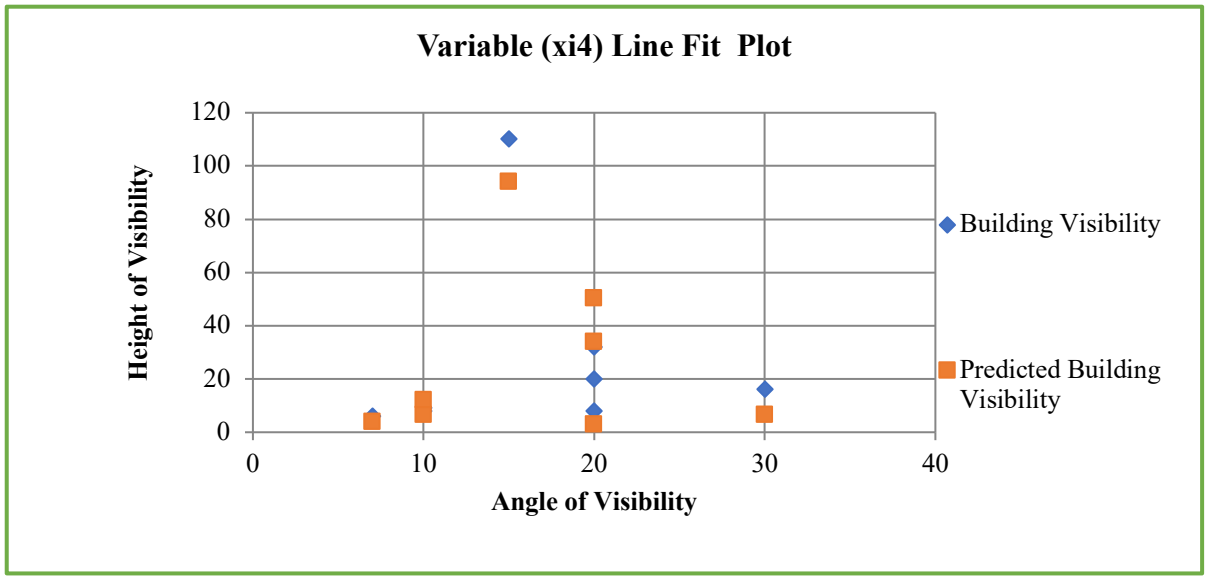


Figure 5-35:Variable Line Fit Plot for Angle of Visibility. (Source: Author)

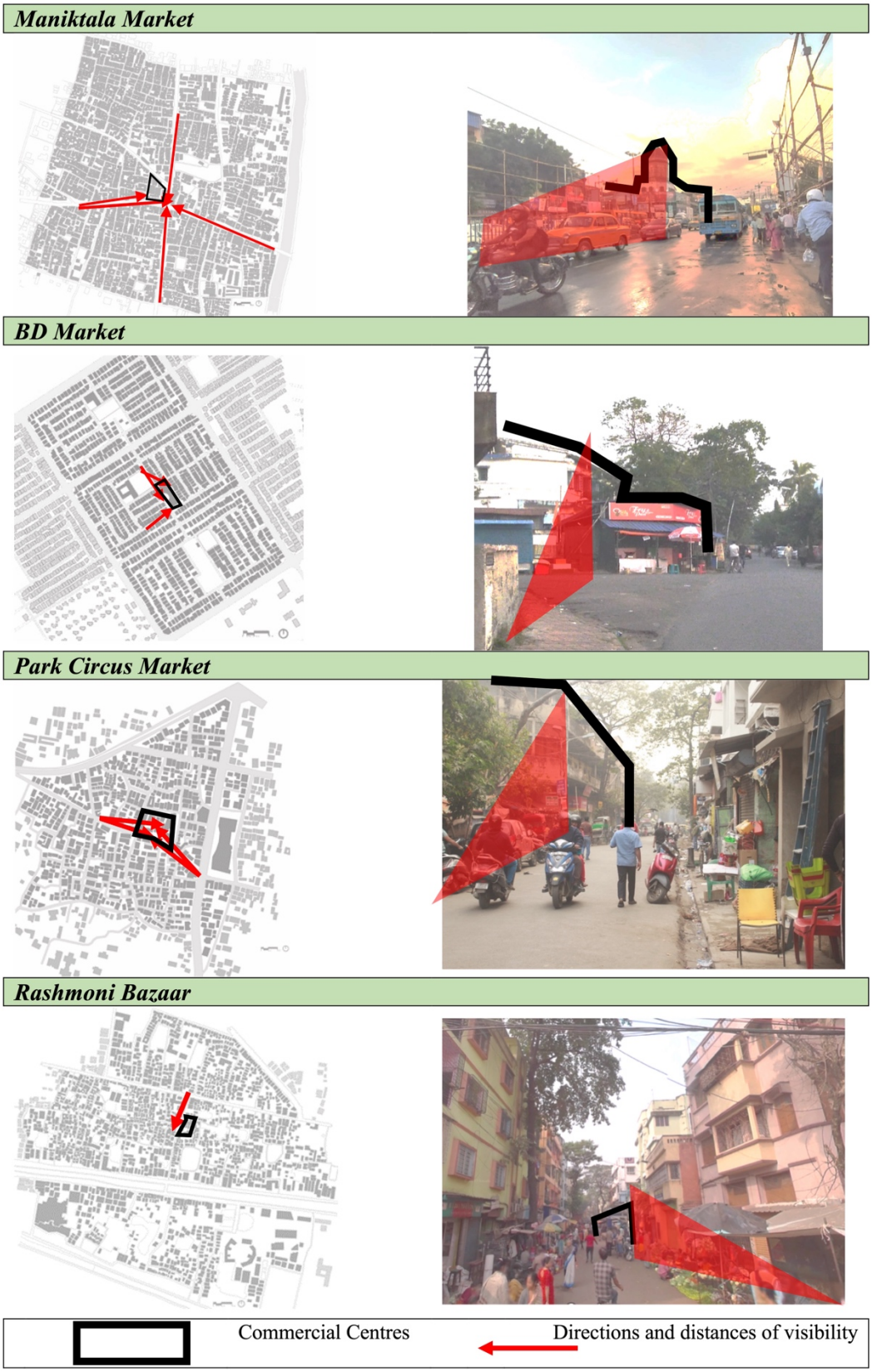


Figure 5-36: Present state of Distance of of CC (Markets)

(Maps: Generated through survey data, Image Source: Author)

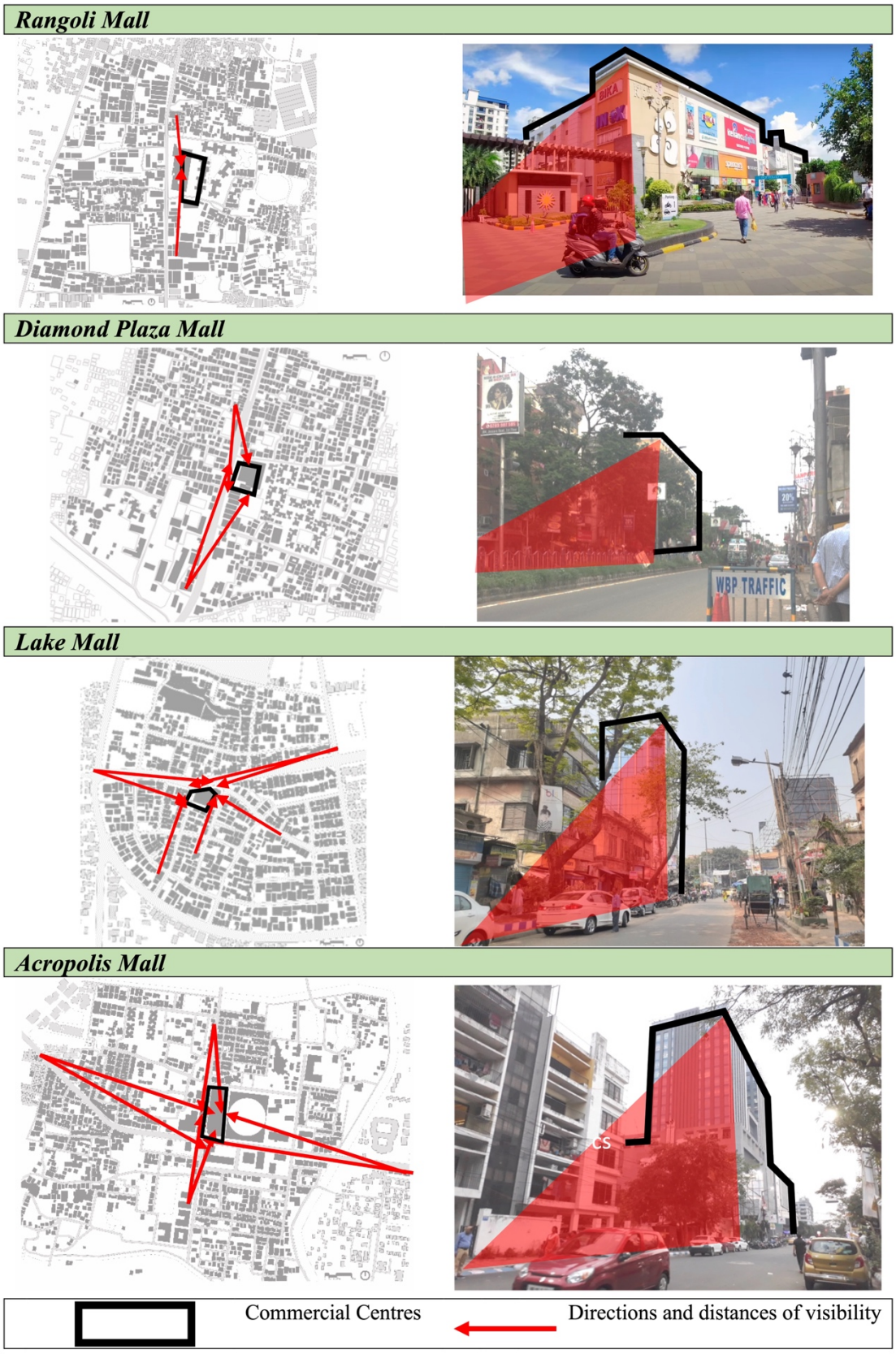


Figure 5-37: Present state of Distance of of CC (Malls).

(Maps: Generated through survey data, Image Source: Author)

5.4 Interpretation

The following section aims at interpreting the current scenario of the 8 Case study areas with the help of the three equations established above.
The above analysis shows that Pedestrian Flows regulate the transformation of Commercial Centres by influencing Activity. This in turn influences the Vitality of Commercial Centres.
Similarly, Time taken to Access the CC regulate the transformation of Commercial Centres by influencing Accessibility. This in turn influences the Liveability of Commercial Centres.

Height of Building regulate the transformation of Commercial Centres by influencing Visibility. This in turn influences the Sense of Place of Commercial Centres.
The 8 selected CC has been evaluated by calculating the values for Pedestrian Flow, Time taken to Access the CC and Height of the CC to give an insight into the current position of the CC in terms of the 3 variables.

Commercial Centre	**Pedestrian Flow (X)**	**Time taken to access (Y)**	**Height of building (Z)**
Maniktala	130,32	4,60	6,15
BD Market	58,36	7,95	11,96
Park Circus	186,56	3,56	2,68
Rashmoni Bazar	101,18	4,98	3,66
Rangoli Mall	157,80	9,86	6,25
Diamond Plaza	209,29	6,03	49,92
Lake Mall	272,84	7,58	33,55
Acropolis Mall	194,95	11,11	93,66

Table 5-7: Values for Pedestrian Flow, Time taken to Access the CC and Height of the CC for each selected CC

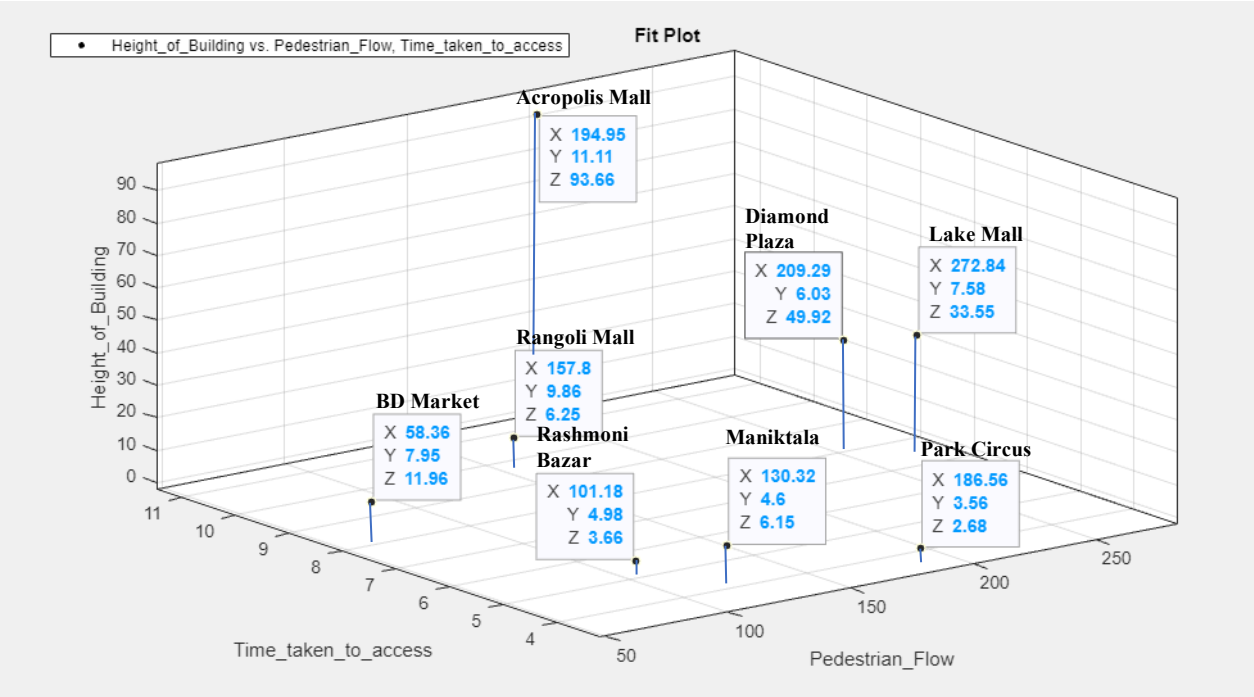


Figure 5-38: Position of the values in a 3D plot generated by MATLAB Curve Fitting Tool.

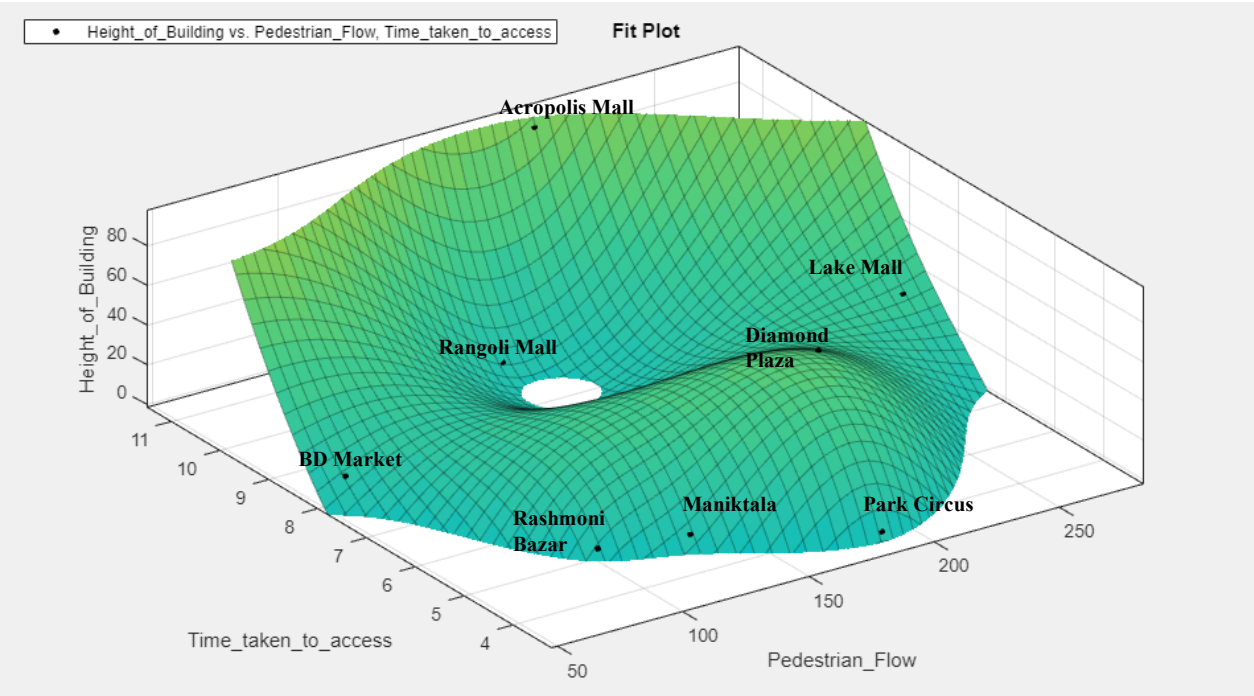


Figure 5- 39: Biharmonic Interpolation plot generated by MATLAB Curve Fitting Tool.

The method used illustrate the same a 3-dimentional plot has been used to generate the position of the values with respect to each other using MATLAB Curve Fitting Tool. The need for an xyz-Plot or a 3D Plot is to visualize the values obtained from variables. A biharmonic

interpolation plot is generated which demonstrates how well the CC are performing in the current situation and can be used to predict the same for future CC in the city of Kolkata.

From the above plot it can be seen that Park Circus Market and Maniktala Markets have high pedestrian flows contributing towards high activity and low time taken to access contributing to better Accessibility. Low Height of CC contributes to lower visibility. It can be inferred that increasing the height of these markets can contribute to better Visibility and in turn adding to a better sense of place to ensure positive transformation.

Out of all the CC, Lake Mall has a more optimal position as it remains active even though it takes higher time to access the building. This can be attributed to the high visibility due to high Height of building which directs people towards the building. On the contrary, BD Market has very low activity because of more time taken to access the site and low height discouraging visibility.

6.0 Conclusions

6.1 Issues

Transformation of commercial centres and process of urban development has emerged as an important area of inquiry in the recent years throughout the world as it has become a common phenomenon across all cities especially in the Global South. These transformations have impacted not only the economic development but also has resulted in massive physical changes in urban form and character of cities. This has led to tremendous social changes which has seen modulations in the preferred kind of shopping based on experiential factors, availability and quality of goods and services and accessibility of multiple functions. Some of the overarching issues emerging out of this research work are:

- Changing of commercial building types from traditional markets to shopping malls leading to random development in cities.
- Drastic expansion of cities due to polycentric urbanism leading to multiple commercial hubs and uncontrolled commercial footprint in retail sector.
- Cities in India are facing similar transformation at rapid pace creating conflicting urban spaces with respect to traditional CC and new typologies like shopping malls.
- Need of guidelines for development of new Commercial Centres with advent of new trends to increase commercial hubs which have become thriving public places.

6.2 Contributions

The contributions of this project on the issue of transformation of Commercial Centres and process of Urban Development can be understood by revisiting the research questions and finding their answers as generated though the research.

RQ 1. What are the transformations occurring in Commercial Centres with respect to established parameters?

As discussed in Chapters 02 and 03, transformation of CC have been happening in terms of the 3 main parameters of Vitality, Liveability and Sense of Place in a city. These parameters have been instrumental in regulating the processes of UD and their subsequent policies all over the world. In case of India, these 3 parameters in the light of transformation of CC has not been studied widely to access the effects of the process.

RQ 2. What are the related sub-parameters of Vitality, Liveability and Sense of Place influence transformation of Commercial Centres with respect to changes in the process of Urban Development?

The related sub-parameters and variables for **Vitality** as given in Table 3-5 are:

Parameter	Sub Parameter	Variable		Unit Measure	Survey type
Vitality	Activity	*Amount of Building Use (Commercial) (Qn)*		*% usage of total urban area considered*	Mapping
		Pedestrian Flow (Qn)		*Average people / minute*	Visual
		Nature of Commercial activity (Ql)	*Formal/ Informal*	*% usage of total urban area considered*	Visual
		Product mix (Ql)	*Types of uses*	*Numbers*	Visual
	Public Space	*Formal Public Space (Qn)*		*Sq.m.*	Mapping
		Informal Public Space (Qn)		*Sq.m.*	Mapping
		Type of Formal Public Space (Ql)			Visual
		Type of Informal Public Space (Ql)			Visual

The related sub-parameters and variables for **Liveability** as given in Table 3-7 are:

Parameter	Sub Parameter	Variable		Unit Measure	Survey Type
Liveability	Location	*Size of Commercial Centre (Qn)*		*Sq.m.*	Mapping
		Distance of Commercial Centre from CBD (Qn)		*K.m.*	Mapping
		Routes - Area Level (Ql)			Visual
		Layout (Ql)			Visual
	Accessibility	*Distance of facilities from neighbourhoods (Qn)*		*metres*	Mapping
		Time taken to access (Qn)		*minutes*	Visual
		Routes - Site level (Ql)			Visual
		Mode of travel (Ql)			Visual
	Safety	*Natural Surveillance (Qn)*	*No. of Active frontages*	*Numbers*	Mapping
		Formal Surveillance (Qn)	*No. of Security Patrol*	*Numbers*	Mapping
			No. of Security cameras	*Numbers*	Mapping
		Types of pathway (Ql) (Open/ Closed)			Visual
		Type of lighting (Ql)			Visual

The related sub parameters and variables for **Sense of Place** as given in Table 3-9 are:

Parameter	Sub Parameter	Variable		Unit	Survey Type
Sense of Place	Urban Form	*Street Width (Qn)*		*metres*	Visual
		Building Height (Qn)		*metres*	Visual
		Building Front Offset (Qn)		*metres*	Visual
		Edge (Ql)			Visual
		Shape			Visual
	Visibility	*Height of visibility/ Height of Building (Qn)*		*metres*	Visual
		Angle of Visibility (Qn)		*degrees*	Visual
		Presence of Obstruction (Ql)	*Trees/ Placards/ % facades under obstruction*	*Numbers/ percentage*	Visual
		Vista and Skyline(Ql)			Visual
	Imageability	*No of Defined Edges (Qn)*		*in Numbers*	Visual
		No. of nodes (Qn)		*in Numbers*	Visual
		No. of pathways (Qn)		*in Numbers*	Visual
		No. of Landmarks (Qn)		*in Numbers*	Visual
		District (Ql)			Visual
		Edge (Qi)			Visual
		Landmark (Ql)			Visual
		Type of Node (Ql)			Visual

RQ 3. What are the most important variables influencing Vitality, Liveability and Sense of Place of Commercial Centres in cities like Kolkata?

The most important variable affecting Vitality is Pedestrian Flow (Pf) which influences the sub-parameter of Activity. For Liveability the determining variable is Time taken to Access which influences the sub-parameter of Accessibility. For Sense of Place the determining variable is Height of Building which influences the sub-parameters of Urban Form and Visibility. These 3 main variables regulate the performance of CC in the city of Kolkata.

RQ 4. What are the types of Commercial Centres which are suitable for cities like Kolkata?

Minimum attainment of Vitality of CC can be achieved by providing Activity by regulating the **Pedestrian flow (Pf).** The mathematical relationship for the same is as follows:

$$Pf = 131.985 - 0.002 \times FPS + 0.02 \times IPS - 13.51 \times BU$$

yi = Pedestrian Flows (Pf)

xi_1 = Formal Public Space (FPS)

xi_2 = Informal Public Space (IPS)

xi_3 = Amount of Built Use (Commercial) (BU)

Minimum attainment Livebility of CC can be achieved by providing Accessibility by regulating the **Time taken to Access (Ta).** The mathematical relationship for the same is as follows:

$$Ta = 3.925 + 0.0001 \times S - 0.362\, D_{CBD} \times +0.0075 \times D_N$$

yi = Time taken to access (Ta)

xi_1 = Size of Commercial Centres (S)

xi_2 = Distance of CC from CBD (D_{CBD})

xi_3 = Distance of CC from Neighbourhood (D_N)

Minimum attainment Sense of Place of CC can be achieved by providing Urban Form and Visibility by regulating the **Height of building (Hb).** The mathematical relationship for the same is as follows:

$$Hb = 23.674 - 1.5121 \times SW + 4.433 \times FO + 0.1089 \times D_{Vmax} - 0.9974 \times A_v$$

yi = Height of Building (Hb)

xi_1 = Street Width (SW)

xi_2 = Building Front Offset (FO)

xi_3 = Max. Distance of Visibility (D_{Vmax})

xi_4 = Angle of Visibility (A_V)

These are applicable to any type of CC, existing or proposed, in Kolkata. Use of similar parameters to ensure successful performance of Commercial Centre across all scales of development in cities of India. Along with this a biharmonic interpolation plot has been generated to visualize the prediction related to all CC present in Kolkata. As seen in Figure 5-39, all 8 case studies fall under the determined curve which is generated by plotting Pedestrian Flow (Vitality) , Time taken to Access (Liveability) and Height of Building (Sense of Place). To improve any of the parameters the corresponding determining variable needs to be altered.

6.3 Future Directions

In future, it would help to undertake necessary corrective interventions, in similar existing situations, to guide them in desired directions. It would also help to develop anticipatory plans with alternative proposals, in similar upcoming situations, so that proper gains can be acquired from them.

- Study of similar transformations in Tier II and Tier III cities across India will help in predicting the transformation trends in such cities.
- Understanding and predicting the role of commercial space as public places with rapid city expansions in the post pandemic scenario.
- Retaining the Vitality and Liveability aspects of commercial public space in such cities to ensure attainment of sense of place and quality of life in such cities regardless of rapid urban development.
- Comparative study of similar transformation in pre-pandemic and post-pandemic scenario.

Subsequently, the ultimate outcome would result in improving overall spatial/ physical environment of such commercial centres in the Global South and overall quality of life of such cities in general.

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APPENDIX 1

QUESTIONNAIRE FOR EXPERT OPINION SURVEY FOR VITALITY:

Vitality of Commercial Centres and Process of Urban Development: Related Sub-Parameters

1. Is Vitality dependent on Comfort? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

2. Is Vitality dependent on Accessibility? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

3. Is Vitality dependent on Public Space? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

4. Is Vitality dependent on Customer Views? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

APPENDIX 1

QUESTIONNAIRE FOR EXPERT OPINION SURVEY FOR VITALITY:

5. Is Vitality Dependent on type of Activity? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

6. Is Vitality dependent on Robustness? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

7. Is Vitality dependent on Location? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

8. Is Vitality Dependent on Conviviality? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

9. Is Vitality Dependent on Density? *

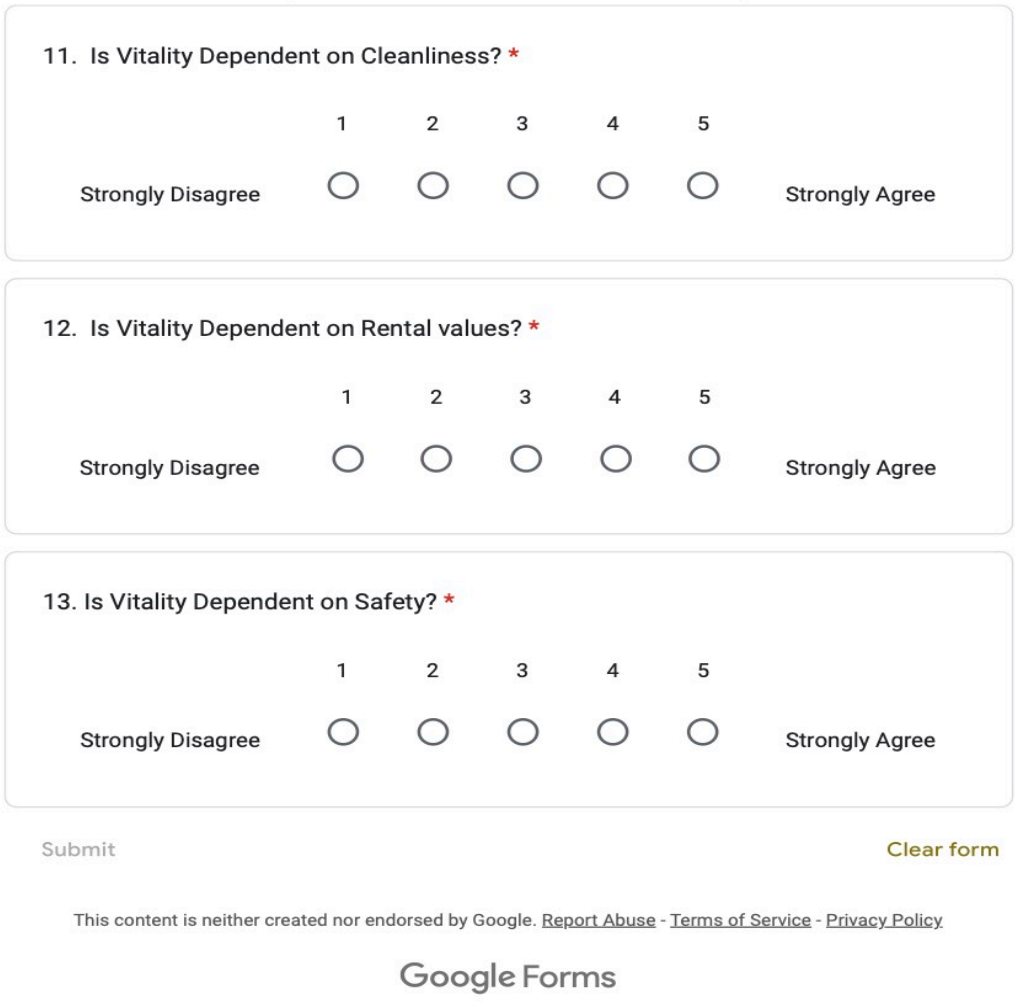
	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

10. Is Vitality Dependent on Urban Form? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

APPENDIX 1

QUESTIONNAIRE FOR EXPERT OPINION SURVEY FOR VITALITY:



11. Is Vitality Dependent on Cleanliness? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

12. Is Vitality Dependent on Rental values? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

13. Is Vitality Dependent on Safety? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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APPENDIX 2

QUESTIONNAIRE FOR EXPERT OPINION SURVEY FOR LIVEABILITY:

Liveability of Commercial Centres and Process of Urban Development: Related Sub-Parameters

1. Is Liveability dependent on Activity? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	◉	○	Strongly Agree

2. Is Liveability dependent on Accessibility? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

3. Is Liveability dependent on Safety? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

4. Is Liveability dependent on Attractiveness? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

APPENDIX 2

QUESTIONNAIRE FOR EXPERT OPINION SURVEY FOR LIVEABILITY:

5. Is Liveability Dependent on Formal Public Space? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

6. Is Liveability Dependent on Informal Public Space? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

7. Is Liveability dependent on Density? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

8. Is Liveability dependent on Location? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

9. Is Liveability Dependent on Imageability? *

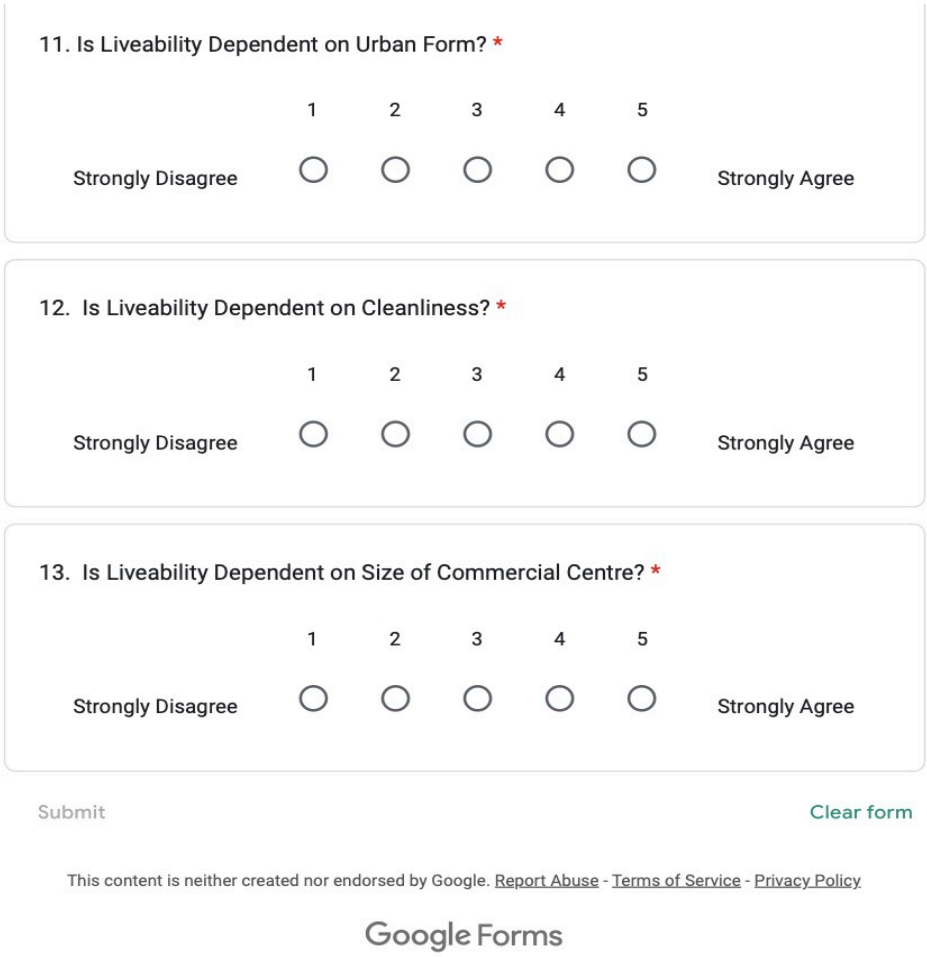
	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

10. Is Liveability Dependent on Visibility? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

APPENDIX 2

QUESTIONNAIRE FOR EXPERT OPINION SURVEY FOR LIVEABILITY:



11. Is Liveability Dependent on Urban Form? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

12. Is Liveability Dependent on Cleanliness? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

13. Is Liveability Dependent on Size of Commercial Centre? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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APPENDIX 3

QUESTIONNAIRE FOR EXPERT OPINION SURVEY FOR SENSE OF PLACE:

Sense of Place of Commercial Centres and Process of Urban Development: Related Sub-Parameters

1. Is SOP dependent on Location? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

2. Is SOP dependent on Accessibility? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

3. Is SOP dependent on Safety? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

4. Is SOP dependent on Vitality? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

APPENDIX 3

QUESTIONNAIRE FOR EXPERT OPINION SURVEY FOR SENSE OF PLACE:

5. Is SOP Dependent on Ambience ? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

6. Is SOP Dependent on Parking? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

7. Is SOP dependent on Quality of Open Spaces? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

8. Is SOP dependent on Legibility? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

9. Is SOP Dependent on Imageability? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

10. Is SOP Dependent on Visibility? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

APPENDIX 3

QUESTIONNAIRE FOR EXPERT OPINION SURVEY FOR SENSE OF PLACE:

11. Is SOP Dependent on Urban Form? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

12. Is SOP Dependent on Emotional Parameters? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

13. Is SOP Dependent on Diversity? *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

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APPENDIX 4

RESPONSES FROM EXPERT OPINION SURVEY FOR VITALITY:

Sl.no.	Questions	Res 1	Res 2	Res 3	Res 4	Res 5	Res 6	Res 7	Res 8	Res 9	Res 10	Res 11	Res 12	Res 13	Res 14	Res 15	Res 16
1	Is Vitality dependent on Activity	5	5	4	5	3	3	5	4	4	4	4	4	5	3	5	5
2	Is Vitality dependent on Accessibility	4	4	3	4	3	3	3	4	4	2	4	3	5	3	4	4
3	Is Vitality dependent on Safety	5	5	3	3	5	4	3	2	2	3	3	3	3	3	4	3
4	Is Vitality dependent on Amount of Public Space	3	3	4	5	4	5	4	3	5	3	3	5	3	4	4	4
5	Is Vitality Dependent on type of Public Space	2	5	5	4	3	5	4	4	5	4	5	5	3	4	5	5
6	Is Vitality dependent on Density	2	2	2	3	5	3	2	4	3	2	2	3	3	3	4	4
7	Is Vitality dependent on Location	3	3	3	2	2	3	4	2	3	3	2	3	3	3	2	2
8	Is Vitality Dependent on Imageability	3	3	3	2	3	2	4	4	3	5	2	2	3	4	3	3
9	Is Vitality Dependent on Visibility	2	3	3	2	2	3	3	3	1	2	3	2	2	3	2	3
10	Is Vitality Dependent on Urban Form	4	4	3	4	3	3	3	3	2	3	4	3	2	3	2	4
11	Is Vitality Dependent on Cleanliness	5	5	4	5	4	2	3	3	2	4	2	2	3	2	2	2
12	Is Vitality Dependent on Rental values	3	2	4	4	2	2	5	2	3	3	3	4	3	3	3	3
13	Is Vitality Dependent on comfort	3	3	4	5	4	5	4	3	5	3	3	5	3	4	4	4

APPENDIX 5

RESPONSES FROM EXPERT OPINION SURVEY FOR LIVEABILITY:

Sl.no.	Questions	Res 1	Res 2	Res 3	Res 4	Res 5	Res 6	Res 7	Res 8	Res 9	Res 10	Res 11	Res 12	Res 13	Res 14	Res 15	Res 16
1	Is LIVEABILITY dependent on Activity	2	3	3	3	3	3	3	3	3	3	3	3	3	4	4	5
2	Is LIVEABILITY dependent on Accessibility	2	3	3	4	4	4	4	4	4	4	4	5	5	5	5	5
3	Is LIVEABILITY dependent on Safety	3	3	3	4	4	4	4	5	5	5	5	5	5	5	5	5
4	Is LIVEABILITY dependent on Amount of Public Space	2	2	2	2	3	3	3	3	4	4	4	4	4	4	5	5
5	Is LIVEABILITY Dependent on Formal Public Space	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
6	Is LIVEABILITY Dependent on Informal Public Space	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4
7	Is LIVEABILITY dependent on Density	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	4
8	Is LIVEABILITY dependent on Location	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	5
9	Is LIVEABILITY Dependent on Imageability	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3	3
10	Is LIVEABILITY Dependent on Visibility	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	4
11	Is LIVEABILITY Dependent on Urban Form	1	1	2	2	2	2	2	2	3	3	3	4	4	5	5	5
12	Is LIVEABILITY Dependent on Cleanliness	1	1	1	1	2	2	2	2	2	3	3	3	3	3	3	3
13	Is LIVEABILITY Dependent on Size of Commercial Centre	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3

APPENDIX 6

RESPONSES FROM EXPERT OPINION SURVEY FOR SENSE OF PLACE:

Sl.no.	Questions	Res 1	Res 2	Res 3	Res 4	Res 5	Res 6	Res 7	Res 8	Res 9	Res 10	Res 11	Res 12	Res 13	Res 14	Res 15	Res 16
1	Is SOP dependent on Activity	1	1	2	2	2	2	2	2	2	3	3	3	3	4	4	5
2	Is SOP dependent on Accessibility	1	1	1	1	1	2	2	2	3	3	3	3	4	4	5	5
3	Is SOP dependent on Safety	1	1	1	2	2	2	2	2	2	3	3	3	4	5	5	5
4	Is SOP dependent on Amount of Public Space	1	1	1	2	2	2	2	2	2	3	3	3	4	4	4	5
5	Is SOP Dependent on Formal Public Space	1	1	1	2	2	2	2	2	2	3	3	3	4	4	4	5
6	Is SOP Dependent on Informal Public Space	1	1	1	2	2	2	2	2	2	3	3	3	4	4	4	5
7	Is SOP dependent on Density	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4
8	Is SOP dependent on Location	1	1	2	2	2	2	2	2	2	2	2	2	2	3	3	3
9	Is SOP Dependent on Imageability	3	3	3	3	4	4	4	4	4	4	4	4	5	5	5	5
10	Is SOP Dependent on Visibility	2	2	3	3	3	4	4	4	4	5	5	5	5	5	5	5
11	Is SOP Dependent on Urban Form	2	3	3	3	3	4	4	4	4	4	4	4	4	5	5	5
12	Is SOP Dependent on Cleanliness	2	2	2	2	2	2	3	3	3	4	4	4	4	4	4	4
13	Is SOP Dependent on Size of Commercial Centre	2	2	2	2	2	2	3	3	3	3	4	4	4	5	5	5

APPENDIX 7
PEDESTRIAN FLOW DATA FOR 2022

Maniktala Market

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	157	185	210	210	187	200	289
11 am - 3 pm	63	126	53	77	102	135	66
3pm - 7pm	23	50	47	14	14	35	10
7 pm - 11 pm	156	100	129	144	206	150	20

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	146	143	176	184	138	235	239
11 am - 3 pm	98	62	77	46	114	41	20
3pm - 7pm	34	63	23	15	32	10	31
7 pm - 11 pm	102	131	132	235	215	145	20

Entrance 3	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	181	180	210	179	184	259	236
11 am - 3 pm	125	84	108	68	64	77	139
3pm - 7pm	15	15	19	11	16	21	22
7 pm - 11 pm	124	121	100	93	96	132	76

Entrance 4	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	121	132	141	132	111	162	145
11 am - 3 pm	63	29	54	88	73	48	55
3pm - 7pm	12	9	12	7	17	12	6
7 pm - 11 pm	54	36	39	28	50	48	56

Rangoli Mall

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	3	5	3	3	6	15	11
11 am - 3 pm	23	22	20	27	27	32	29
3pm - 7pm	22	18	21	25	19	36	32
7 pm - 11 pm	41	42	46	38	32	50	53

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	4	7	8	5	10	20	18
11 am - 3 pm	56	48	61	54	50	111	98
3pm - 7pm	124	126	112	145	134	171	160
7 pm - 11 pm	167	323	311	320	295	382	367

BD Market

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	52	56	50	51	45	64	61
11 am - 3 pm	22	12	20	19	17	15	10
3pm - 7pm	0	0	1	2	0	5	3
7 pm - 11 pm	54	43	39	51	50	23	36

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	32	30	31	30	32	45	20
11 am - 3 pm	20	21	25	19	17	15	20
3pm - 7pm	1	0	3	5	0	1	1
7 pm - 11 pm	32	31	30	27	37	44	40

Entrance 3	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	20	21	20	19	25	30	32
11 am - 3 pm	10	15	17	19	20	21	23
3pm - 7pm	0	1	0	0	0	2	2
7 pm - 11 pm	21	20	18	18	17	21	21

Diamond Plaza

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	3	5	10	7	15	30	17
11 am - 3 pm	119	150	207	113	124	133	111
3pm - 7pm	235	201	277	243	230	218	249
7 pm - 11 pm	332	265	313	350	365	413	396

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	3	2	7	6	3	11	15
11 am - 3 pm	50	57	42	21	39	62	82
3pm - 7pm	32	53	33	21	26	35	52
7 pm - 11 pm	50	75	26	38	21	65	72

Park Circus Market

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	123	195	185	189	151	186	164
11 am - 3 pm	51	53	48	32	35	86	74
3pm - 7pm	23	21	20	30	25	42	45
7 pm - 11 pm	151	153	143	140	148	198	188

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	176	183	123	164	186	256	120
11 am - 3 pm	170	175	164	181	203	130	156
3pm - 7pm	32	30	21	25	22	46	56
7 pm - 11 pm	132	125	120	112	127	156	150

Entrance 3	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	163	122	131	154	124	210	236
11 am - 3 pm	56	64	60	62	76	100	99
3pm - 7pm	45	46	50	53	42	88	86
7 pm - 11 pm	155	136	139	140	142	142	112

Entrance 4	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	98	96	80	86	94	100	123
11 am - 3 pm	74	51	70	73	68	63	97
3pm - 7pm	33	35	30	31	30	63	65
7 pm - 11 pm	63	66	78	70	71	83	80

Lake Mall

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	0	2	5	7	3	18	10
11 am - 3 pm	86	85	103	100	93	132	135
3pm - 7pm	200	223	214	231	217	324	252
7 pm - 11 pm	312	348	325	267	243	359	463

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	3	0	3	2	4	11	12
11 am - 3 pm	86	85	103	100	93	132	135
3pm - 7pm	200	223	214	231	217	324	252
7 pm - 11 pm	312	348	325	267	243	359	463

Rashmoni Bazar

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	135	163	156	136	234	238	325
11 am - 3 pm	100	84	86	81	127	153	116
3pm - 7pm	23	20	18	20	21	32	14
7 pm - 11 pm	150	121	138	111	114	176	102

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	98	99	97	100	86	154	132
11 am - 3 pm	65	65	87	93	85	64	65
3pm - 7pm	7	8	10	10	8	15	15
7 pm - 11 pm	84	89	90	90	84	114	110

Acropolis Mall

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	6	7	10	9	7	15	15
11 am - 3 pm	85	86	111	96	75	113	136
3pm - 7pm	215	263	267	241	267	201	223
7 pm - 11 pm	320	341	326	275	359	329	343

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	2	2	5	5	5	13	12
11 am - 3 pm	73	59	66	70	69	98	100
3pm - 7pm	161	153	160	157	142	188	192
7 pm - 11 pm	129	135	153	142	126	184	229

APPENDIX 8
PEDESTRIAN FLOW RECORDS FOR 2021

Maniktala Market

Entrance 1	***Weekday 1***	***Weekday 2***	***Weekday 3***	***Weekend 1***	***Weekend 2***
7am-11 am	79	93	105	105	94
11 am - 3 pm	32	63	27	39	51
3pm - 7pm	12	25	24	7	7
7 pm - 11 pm	78	50	65	72	103

Entrance 2	***Weekday 1***	***Weekday 2***	***Weekday 3***	***Weekend 1***	***Weekend 2***
7am-11 am	73	72	88	92	69
11 am - 3 pm	49	31	39	23	57
3pm - 7pm	17	32	12	8	16
7 pm - 11 pm	51	66	66	118	108

Entrance 3	***Weekday 1***	***Weekday 2***	***Weekday 3***	***Weekend 1***	***Weekend 2***
7am-11 am	91	90	105	90	92
11 am - 3 pm	63	42	54	34	32
3pm - 7pm	8	8	10	6	8
7 pm - 11 pm	62	61	50	47	48

Entrance 4	***Weekday 1***	***Weekday 2***	***Weekday 3***	***Weekend 1***	***Weekend 2***
7am-11 am	61	66	71	66	56
11 am - 3 pm	32	15	27	44	37
3pm - 7pm	6	5	6	4	9
7 pm - 11 pm	27	18	20	14	25

Rangoli Mall

Entrance 1	***Weekday 1***	***Weekday 2***	***Weekday 3***	***Weekend 1***	***Weekend 2***
7am-11 am	2	3	2	2	3
11 am - 3 pm	12	11	10	14	14
3pm - 7pm	11	9	11	13	10
7 pm - 11 pm	21	21	23	19	16

Entrance 2	***Weekday 1***	***Weekday 2***	***Weekday 3***	***Weekend 1***	***Weekend 2***
7am-11 am	2	3.5	4	2.5	5
11 am - 3 pm	28	24	31	27	25
3pm - 7pm	62	63	56	73	67
7 pm - 11 pm	84	162	156	160	148

BD Market

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	26	28	25	32	32
11 am - 3 pm	11	6	10	7	5
3pm - 7pm	0	0	0.5	7	5
7 pm - 11 pm	27	22	28	12	18

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	16	15	16	23	10
11 am - 3 pm	10	11	13	8	10
3pm - 7pm	1	0	2	1	1
7 pm - 11 pm	16	16	15	22	20

Entrance 3	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	10	11	10	15	16
11 am - 3 pm	5	8	8	10	12
3pm - 7pm	0	1	0	1	1
7 pm - 11 pm	12	10	9	12	20

Diamond Plaza

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	2	3	5	15	6
11 am - 3 pm	60	75	100	65	56
3pm - 7pm	102	123	120	109	110
7 pm - 11 pm	166	98	120	187	198

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	3	1	1	1	3
11 am - 3 pm	25	21	21	31	41
3pm - 7pm	16	17	10	10	26
7 pm - 11 pm	25	38	13	25	36

Park Circus Market

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	60	78	87	93	82
11 am - 3 pm	12	20	24	43	37
3pm - 7pm	12	10.5	10	21	20
7 pm - 11 pm	60	45	62	99	94

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	88	75	34	128	60
11 am - 3 pm	85	65	82	65	78
3pm - 7pm	16	15	3	23	28
7 pm - 11 pm	66	45	60	78	75

Entrance 3	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	58	61	45	89	87
11 am - 3 pm	28	32	30	50	43
3pm - 7pm	14	23	25	44	43
7 pm - 11 pm	35	68	47	71	56

Entrance 4	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	32	37	40	50	51
11 am - 3 pm	37	35	35	15	32
3pm - 7pm	12	12	15	13	15
7 pm - 11 pm	17	33	39	27	40

Lake Mall

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	7	10	7	73	50
11 am - 3 pm	43	43	52	83	130
3pm - 7pm	100	112	107	116	109
7 pm - 11 pm	156	174	162	137	121

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	12	10	7	50	100
11 am - 3 pm	65	76	60	50	58
3pm - 7pm	100	139	107	120	120
7 pm - 11 pm	156	174	184	145	130

Rashmoni Bazar

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	68	90	78	119	45
11 am - 3 pm	50	42	43	79	58
3pm - 7pm	15	10	9	154	130
7 pm - 11 pm	75	65	69	147	167

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	49	34	45	77	66
11 am - 3 pm	37	34	34	87	60
3pm - 7pm	7	4	5	10	93
7 pm - 11 pm	42	48	45	57	134

Acropolis Mall

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	3	5	5	5	8
11 am - 3 pm	45	43	60	48	54
3pm - 7pm	120	135	139	128	153
7 pm - 11 pm	160	179	163	145	185

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekend 1*	*Weekend 2*
7am-11 am	1	1	4	3	8
11 am - 3 pm	37	35	33	35	32
3pm - 7pm	84	78	80	86	71
7 pm - 11 pm	68	62	79	71	63

APPENDIX 9
PEDESTRIAN FLOW RECORDS FOR 2019

Maniktala Market

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	126	148	168	168	150	160	231
11 am - 3 pm	50	101	42	62	82	108	53
3pm - 7pm	18	40	38	11	11	28	8
7 pm - 11 pm	125	80	103	115	165	120	16

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	131	129	158	166	124	212	215
11 am - 3 pm	88	56	69	41	103	37	18
3pm - 7pm	31	57	21	14	29	9	28
7 pm - 11 pm	92	118	119	212	194	131	18

Entrance 3	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	253	252	294	251	258	363	330
11 am - 3 pm	175	118	151	95	90	108	195
3pm - 7pm	21	21	27	15	22	29	31
7 pm - 11 pm	174	169	140	130	134	185	106

Entrance 4	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	157	172	183	172	144	211	189
11 am - 3 pm	82	38	70	114	95	62	72
3pm - 7pm	16	12	16	9	22	16	8
7 pm - 11 pm	70	47	51	36	65	62	73

Rangoli Mall

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	6	7	6	10	10	21	15.4
11 am - 3 pm	38	36	28	3	48	98	76
3pm - 7pm	39	27	36	35	39	80	45
7 pm - 11 pm	60	60	65	59	50	70	120

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	5	10	17	7	14	28	29
11 am - 3 pm	76	65	89	78	159	15	145
3pm - 7pm	178	180	159	210	200	264	251
7 pm - 11 pm	233	452	465	476	430	547	515

BD Market

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	68	73	65	66	59	96	92
11 am - 3 pm	29	16	26	25	22	23	15
3pm - 7pm	0	0	1	3	0	8	5
7 pm - 11 pm	70	56	51	66	65	35	54

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	42	39	40	39	42	68	30
11 am - 3 pm	26	27	33	25	22	23	30
3pm - 7pm	1	0	4	7	0	2	2
7 pm - 11 pm	42	40	39	35	48	66	60

Entrance 3	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	26	27	26	25	33	39	48
11 am - 3 pm	13	20	22	25	26	27	35
3pm - 7pm	0	1	0	0	0	3	3
7 pm - 11 pm	27	26	23	23	22	27	32

Diamond Plaza

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	4	7	14	10	21	42	24
11 am - 3 pm	167	210	290	158	174	186	155
3pm - 7pm	282	241	332	292	276	262	299
7 pm - 11 pm	398	318	376	420	438	496	475

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	4	3	10	8	4	15	21
11 am - 3 pm	70	80	59	29	55	87	115
3pm - 7pm	45	74	46	29	36	49	73
7 pm - 11 pm	70	105	36.4	53.2	29.4	91	100.8

Park Circus Market

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	160	254	241	246	196	242	213
11 am - 3 pm	66	69	62	42	46	112	96
3pm - 7pm	30	27	26	39	33	55	59
7 pm - 11 pm	196	199	186	182	192	257	244

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	229	238	160	213	242	333	156
11 am - 3 pm	221	228	213	235	264	169	203
3pm - 7pm	42	39	27	33	29	60	73
7 pm - 11 pm	172	163	156	146	165	203	195

Entrance 3	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	147	110	118	139	112	189	212
11 am - 3 pm	50	58	54	56	68	90	89
3pm - 7pm	41	41	45	48	38	79	77
7 pm - 11 pm	140	122	125	126	128	128	101

Entrance 4	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	88	86	72	77	85	90	111
11 am - 3 pm	67	46	63	66	61	57	87
3pm - 7pm	30	32	27	28	27	57	59
7 pm - 11 pm	57	59	70	63	64	75	72

Lake Mall

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	0	3	7	9	4	23	13
11 am - 3 pm	112	111	134	130	121	172	176
3pm - 7pm	260	290	278	300	282	421	328
7 pm - 11 pm	406	452	423	347	316	467	602

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	4	0	4	3	5	14	16
11 am - 3 pm	112	111	134	130	121	172	176
3pm - 7pm	260	290	278	300	282	421	328
7 pm - 11 pm	406	452	423	347	316	467	602

Rashmoni Bazar

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	162	196	187	163	281	286	390
11 am - 3 pm	120	101	103	97	152	184	139
3pm - 7pm	28	24	22	24	25	38	17
7 pm - 11 pm	180	145	166	133	137	211	122

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	118	119	116	120	103	185	158
11 am - 3 pm	78	78	104	112	102	77	78
3pm - 7pm	8	10	12	12	10	18	18
7 pm - 11 pm	101	107	108	108	101	137	132

Acropolis Mall

Entrance 1	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	8	10	14	13	10	21	21
11 am - 3 pm	119	120	155	134	105	158	190
3pm - 7pm	301	368	374	337	374	281	312
7 pm - 11 pm	448	477	456	385	503	461	480

Entrance 2	*Weekday 1*	*Weekday 2*	*Weekday 3*	*Weekday 4*	*Weekday 5*	*Weekend 1*	*Weekend 2*
7am-11 am	3	3	7	7	7	18	17
11 am - 3 pm	102	83	92	98	97	137	140
3pm - 7pm	225	214	224	220	199	263	269
7 pm - 11 pm	181	189	214	199	176	258	321

APPENDIX 10
DATA AVERAGES FOR BUILT USE % AND PEDESTRIAN FLOW

2019	**Markets**	Built use %			Pedestrian flow
		Commercial	Mixed use	Sum of usages	
	Case A- Maniktala	1.01	8.75	9.76	103.30
	Case B- BD Market	0.59	4.66	5.25	30.47
	Case C-Park Circus	4.32	7.21	11.53	114.80
	Case D- Rashmoni Bazar	0.83	4.85	5.68	109.61
	Average			8.055	89.55
	Malls	Built use %			Pedestrian flow
		Commercial	Mixed use	Sum of usages	
	Case A- Rangoli Mall	1.67	1.79	3.46	115.22
	Case B- Diamond Plaza	2.13	4.36	6.49	145.95
	Case C- Lake Mall	4.2	6.72	10.92	217.58
	Case D- Acropolis Mall	2.63	3.23	5.86	193.13
	Average			6.6825	167.97

2021	**Markets**	Built use %			Pedestrian flow
		Commercial	Mixed use	Sum of usages	
	Case A- Maniktala	1.01	8.75	9.76	67.15
	Case B- BD Market	0.59	4.66	5.25	15.24
	Case C-Park Circus	4.32	7.21	11.53	45.92
	Case D- Rashmoni Bazar	0.83	4.85	5.68	63.57
	Average			8.055	47.97
	Malls	Built use %			Pedestrian flow
		Commercial	Mixed use	Sum of usages	
	Case A- Rangoli Mall	1.67	1.79	3.46	40.33
	Case B- Diamond Plaza	2.13	4.36	6.49	62.76
	Case C- Lake Mall	4.2	6.72	10.92	91.38
	Case D- Acropolis Mall	2.63	3.23	5.86	73.39
	Average			6.6825	66.96

2022	**Markets**	Quantitative			
		Built use %			Pedestrian flow
		Commercial	Mixed use	Sum of usages	
	Case A- Maniktala	1.01	8.75	9.76	96.07
	Case B- BD Market	0.59	4.66	5.25	21.94
	Case C-Park Circus	4.32	7.21	11.53	102.17
	Case D- Rashmoni Bazar	0.83	4.85	5.68	93.17
	Average			8.055	78.34
	Malls	Quantitative			
		Built use %			Pedestrian flow
		Commercial	Mixed use	Sum of usages	
	Case A- Rangoli Mall	1.67	1.79	3.46	78.35
	Case B- Diamond Plaza	2.13	4.36	6.49	109.46
	Case C- Lake Mall	4.2	6.72	10.92	169.71
	Case D- Acropolis Mall	2.63	3.23	5.86	135.19
	Average			6.6825	123.18

APPENDIX 11
MULTIPLE REGRESSION STATISTICS FOR PEDESTRIAN FLOW DETERMINING VITALITY

Regression Statistics	
Multiple R	0.940135806
R Square	0.883855334
Adjusted R Square	0.796746834
Standard Error	26.05543859
Observations	8

COEFFICIENTS AND STANDARD ERROR FOR EACH INDEPENDENT VARIABLE FOR PEDESTRIAN FLOW DETERMINING VITALITY

	Coefficients	*Standard Error*
y-Intercept	131.9852675	28.14787408
Formal Public Space (A)	-0.001960523	0.000401486
Informal Public Space(B)	0.017060596	0.003342045
Sum of Usages(C)	-13.5175194	5.306209233

APPENDIX 12

MULTIPLE REGRESSION STATISTICS FOR TIME TAKEN TO ACCESS DETERMINING LIVEABILITY.

Regression Statistics	
Multiple R	0.886082816
R Square	0.785142757
Adjusted R Square	0.623999825
Standard Error	1.916433144
Observations	8

COEFFICIENTS AND STANDARD ERROR FOR EACH INDEPENDENT VARIABLE FOR TIME TAKEN TO ACCESS DETERMINING LIVEABILITY

	Coefficients	*Standard Error*
y-intercept ($\beta 0$)	3.924912655	2.74071226
Size of Commercial Centres (S)	0.000108453	7.86116E-05
Distance of CC from CBD (D_{CBD})	-0.362268522	0.430735195
Distance of CC from Neighbourhood (D_N)	0.007473574	0.003816116

APPENDIX 13

MULTIPLE REGRESSION STATISTICS FOR HEIGHT OF BUILDING DETERMINING SENSE OF PLACE.

Regression Statistics	
Multiple R	0.919902678
R Square	0.846220937
Adjusted R Square	0.641182186
Standard Error	20.95310999
Observations	8

COEFFICIENTS AND STANDARD ERROR FOR EACH INDEPENDENT VARIABLE FOR HEIGHT OF BUILDING DETERMINING SENSE OF PLACE.

	Coefficients	*Standard Error*
y-intercept ($\beta 0$)	23.67418909	35.07098299
Street Width (SW)	-1.512183609	3.022611968
Building Front Offset (FO)	4.433174846	3.795438139
Max. Distance of Visibility (D_{Vmax})	0.108884711	0.062984266
Angle of Visibility (A_V)	-0.997405155	1.362548353